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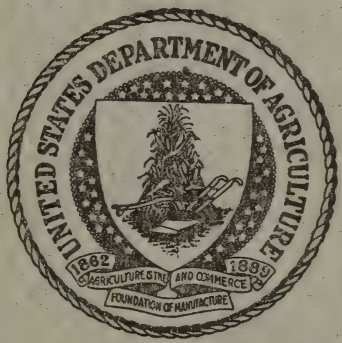
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UNITED STATES DEPARTMENT OF AGRICULTURE
OFFICE OF EXPERIMENT STATIONS

Vol. 68 JANUARY, 1933 No. 1

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EXPERIMENT STATION RECORD

Editor: HOWARD LAWTON KNIGHT

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EXPERIMENT STATION RECORD

VOL. 68 JANUARY, 1933 No. 1

EDITORIAL

THE FORTY-SIXTH CONVENTION OF THE ASSOCIATION OF LAND-GRANT COLLEGES AND UNIVERSITIES

Perhaps the most distinctive feature of the 1932 convention of the Association of Land-Grant Colleges and Universities, held in Washington, D. C., from November 14–16, was its responsiveness to the prevailing economic situation. Not only was the program built around this situation and the resulting problems of readjustment, but its influence permeated well-nigh every discussion and in one way or another dominated the proceedings from beginning to end.

Largely as an immediate consequence of the pressure for economy, the convention attendance was the smallest in years. The importance of the gathering was not in question and with two exceptions every State was represented, but many of the delegations were much curtailed. Not far from the usual quota of 30 presidents or other administrative heads was registered, but the number of deans of colleges of agriculture recorded dropped from the normal average of 45 or over to 34, the experiment station directors to 36, the extension directors to 31, the deans of engineering to 22, and the heads of home economics activities to 23. This reduction in attendance corresponded in general to the distance from Washington, and reflected the prevailing disposition to hold traveling expenses, as well as other operating costs, to as low a figure as possible.

The shortage in aggregate numbers, however, was rendered less noticeable by the high percentage of attendance on the various sessions. Interest was well-sustained throughout, despite a number of somewhat protracted meetings, and such opportunities as were available for discussions from the floor were freely utilized.

Much of this interest may fairly be attributed to the timeliness of the program and the extent to which it centered around matters of direct and practical appeal. Little time was given to discourses of a theoretical nature, and even less to retrospect and reminiscence.

This concentration upon the affairs of the immediate present does not imply an absence of what may be termed the long-time view.

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One of the outstanding contributions of the convention was the presidential address of President E. O. Holland of the State College of Washington, in which the philosophy of the American system of education was discussed not only with reference to the present economic situation but in its bearing upon the permanent well-being of the Nation. In this address President Holland contrasted the early theory of providing training for only a small minority with the prevailing democratic conception of the enlightenment of the masses in the fullest possible degree. He drew attention to the danger now confronting the latter policy from retrenchment programs, and from this standpoint deprecated arbitrary attempts to reduce educational expenditures as unwarranted and unwise. In his opinion the remedy to be sought in an emergency like the present lies less in curtailment of appropriations for essential activities than in the establishment of equitable and adequate tax systems to redistribute the tax-carrying load. Despite the efforts of reactionary groups, he predicted that the publicly-supported institutions for higher education will continue to hold the confidence of their constituency, and that the doors of opportunity which they have unsealed to the youth of the Nation will be kept open.

Under the title of The Battle Line of Economic Change, Dr. E. G. Nourse, director of the Institute of Economics of the Brookings Institution, discussed various phases of the economic situation as to their causes, effects, and remedies. The complexity of the situation was pointed out, and the view was expressed that undue effort is being made to restore and preserve the stabilization of the past rather than to accept the philosophy and viewpoint of a surplus economy status, such as is now developing in this country. This profound change will necessitate many readjustments, and he advocated the continued encouragement and support of scientific and technical effort as a basis for the redirection of thought and activities which appears to be inevitable.

What some of these readjustments may involve as regards agriculture was set forth more fully and specifically in a report on the agricultural situation by a special committee of the association headed by Dean T. P. Cooper of Kentucky. This report supplemented that of a similar committee in 1927 and dealt convincingly with the sweeping changes which have come about since that time. The majority of the 42 land-grant institutions reporting agreed that the characteristics of the present situation included the low agricultural prices, high taxation, excessive debt and interest load, low cash income in relation to cash outlay required, and lack of agricultural credit, and they considered as the more important causes the weak foreign demand and the greatly diminished domestic consumption due to unemployment and the effects of deflation. The most

commonly proposed remedies suggested improved farm organization and management, modifications of international relations, increased cooperative action of farmers, tax adjustments on farm real estate, and the adoption of a sound general land policy.

The factor of land utilization received further consideration in a paper entitled Elements of a Land Utilization Policy presented by President F. D. Farrell of Kansas, chairman of the National Land Use Planning Committee, as well as in a symposium in the extension subsection on land utilization and its relation to extension work. President Farrell pointed out that the dominant objective in land utilization should be that of wise perpetual use, and that sectionalism and individualism must be secondary to the national welfare. Taxation must be so adjusted that land resources may be conserved and not exploited. Agricultural credit must be administered with reference to its relation to the wise use of land, and he believed that provision must ultimately be made for an effective control of land utilization by some central national agency.

The challenge of the economic situation to the land-grant institutions was also taken up by the several sections. Thus, in the section on agriculture Mr. N. A. Olsen, chief of the Bureau of Agricultural Economics, discussed The World Depression and Its Bearing on Teaching, Research, and Extension; Deans C. E. Ladd of Cornell University and L. E. Call of Kansas, Correlating Teaching, Research, and Extension to Meet the Present Emergency; and Director W. H. Brokaw of Nebraska and Dean J. G. Lee, jr., of Louisiana, Correlating Extension and Vocational Agriculture. At another session Provost A. R. Mann of Cornell University considered The Function of the College in Agricultural Adjustment, and Dr. A. F. Woods, director of scientific work of the U. S. Department of Agriculture, Adjustments in Research to Meet the Present Emergency.

Other aspects of the matter were taken up in the subsection on resident teaching, which opened its sessions with a paper on The Readjustment of Our Curricula to Meet the New Economic Situation, by President A. M. Soule of Georgia. The engineering section discussed the question of whether the engineering schools are producing more graduates than are needed. The section on home economics, with a program so congested that its final paper was withheld from presentation, devoted an entire session to a series of papers on adjustments in home economics administration resulting from current economic changes. A symposium on Readjusting the Extension Program to Meet Changing Economic Conditions was the first item taken up by the subsection on extension work. In the subsection on experiment station work, Director F. B. Mumford of Missouri discussed The Responsibility of the Agricultural Experiment Station

for the Present Agricultural Situation, controverting the idea sometimes advanced that the stations are interested primarily in increased production, and maintaining that the primary economic purpose of the station work "is to provide the knowledge necessary for the farmer to adapt himself to the changing conditions.

Still another phase of the situation which received close attention was the effect of the depression upon the land-grant institutions themselves. This subject had been studied by a special committee headed by President H. S. Boardman of Maine, and the report of this committee and accompanying discussion was supplemented by papers entitled Adjusting the College to Decreased Revenues, by Deans J. H. Skinner of Indiana and F. B. Mumford of Missouri. A situation of increasing seriousness was revealed for many institutions, with considerable decreases in revenues in effect or impending without proportionate reduction in the work to be done. The problem has thus become, as was set forth by President J. A. Burruss of Virginia, one of effecting the necessary economies with a minimum loss of efficiency and morale. Substantial savings through curtailments in operating expenses, travel costs, and similar expedients were reported in many cases, the opinion being general that reductions in salaries should be deferred until other adjustments had been more nearly exhausted.

The advantages of closer cooperation and coordination of work as an aid toward increased economy and efficiency were set forth by several speakers. Under the title of Federal and State Cooperation in Agricultural Education and Research, Dr. Woods discussed the existing status, revealing substantial progress in these directions. Director W. L. Slate of Connecticut described the practical achievements in coordination of research between stations in the Northeastern States, and the report of the joint committee on projects and correlation of research made further suggestions for the future. This topic and others pertaining to research will be discussed at some length in the next issue of the *Record.*

The sessions of the executive body were as usual held behind closed doors, and information as to action taken on most matters of business is therefore not available for presentation at this time. For the ensuing year, President J. C. Futrall of Arkansas was elected president of the association, with President T. O. Walton of Texas as vice president, while Dean T. P. Cooper of Kentucky was reelected secretary-treasurer. Provost A. R. Mann of Cornell University succeeded President R. D. Hetzel of Pennsylvania as a member of the executive committee. The various section officers and changes in committee appointments are noted on page 139.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

The state of water in colloidal and living systems, R. A. GORTNER (*Faraday Soc. Trans., 26 (1930), No. 12, pp. 678–704; abs. in Minnesota Sta. Rpt. 1931, pp. 27, 28*).—The author points out that in lyophilic hydrosols and hydrogels the water may exist in two states, i. e., in the state of free water which is characteristic of water in bulk and in the state of bound water which is characteristic of the lyophilic system. It is furthermore pointed out that this equilibrium between free and bound water is undoubtedly of major importance in vital phenomena. Two hypotheses have been presented as to the possible nature of bound water—(1) an oriented adsorption of the water dipoles at the interface, and (2) an oriented adsorption of hydrogen and hydroxyl ions.

Studies on electrokinetic potentials, V–VIII (*Jour. Phys. Chem., 34 (1930), No. 7, pp. 1509–1539, figs. 4; 35 (1931), Nos. 1, pp. 309–330, figs. 9; 2, pp. 456–466, figs. 12. 3, pp. 700–721, figs. 9; abs. in Minnesota Sta. Rpt. 1931, pp. 23, 27, 31*).—Continuing a series of contributions from the Minnesota Experiment Station on the ζ-potential (E. S. R., 60, p. 503), of which the first three papers have not previously been noted[1 2 3] the authors present in the four papers here noted further experimental and theoretical advances in part as follows:

V. *Interfacial energy and the molecular structure of organic compounds. I. Electrokinetic potentials at cellulose-organic liquid interfaces,* by W. McK. Martin and R. A. Gortner.—"Studies of the factors influencing streaming-potential measurements have shown that with cellulose-organic liquid interfaces the ratio of E.M.F./P for pure liquids arises at zero and approaches a constant value with progressively increasing pressures."

The ζ-potential at a cellulose-organic liquid interface was found to be a function of the structure of the molecules oriented at the interface, the relative symmetry of the molecules with respect to polar groups or double bonds determining the sign and magnitude of the potential. In a homologous series of the *n*-aliphatic alcohols, a $-CH_2$-group in the chain altered the ζ-potential by approximately ± 36 mv, whereas the substitution of a methyl group for a hydrogen atom to form a branched-chain alcohol altered the ζ-potential by only $\pm^4$ mv.

The symmetrical hydrocarbon, benzene, produced no measurable ζ-potential when streamed through a cellulose membrane; the somewhat unsymmetrical but nonpolar methyl benzene produced a low but measurable potential; and of all compounds investigated the highly polar and unsymmetrical nitrobenzene produced the highest potential. When various groups were substituted for hydrogen in the benzene molecule, the electrokinetic effect followed the order $H < CH_3 < Cl < Br < NH_2 < NO_2$.

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[1] Jour. Phys. Chem., 32 (1928), No. 5, pp. 641–675, figs. 4.

[2] *In* Colloid Symposium Monograph, VI, edited by H. B. Weiser. New York: Chem. Catalog Co., 1928, vol. 6, pp. 41–52, figs. 3.

[3] Jour. Amer. Chem. Soc., 50 (1928), No. 9, pp. 2358–2363, fig. 1.

"The data support the theory of a helicoidal configuration of the carbon atoms in a homologous series of the *n*-aliphatic alcohols. . . . Since the ζ-potential is a function of molecular structure, the streaming-potential method may be used advantageously in studies dealing with the structural configuration of molecules. The ζ-potential values may also be used as a criterion of purity of chemical compounds."

VI. *Electrical phenomena at interfaces*, by H. B. Bull and R. A. Gortner.—In a mathematical discussion of the theoretical considerations affecting the potential relations under investigation, the authors present a modification by means of appropriate substitutions of the Smoluchowski equation for surface conductance, whereby they obtained two equations of which the one expresses the charge per unit area on the surface, while the other deals with the thickness of the double layer. The experimental work yielded a large volume of data on the ζ-potential and the surface conductance at a cellulose interface in aqueous solutions of the chlorides of sodium, potassium, magnesium, and calcium, as well as in those of potassium carbonate, sulfate, and phosphate, and of thorium chloride.

The work is considered to indicate that the ζ-potential in general decreases with increasing concentration of electrolytes in the aqueous phase, but that this decrease in the ζ-potential may be accompanied by an actual increase in the charge on the particle, the decrease in the ζ-potential being more nearly related to a decrease in the thickness of the double layer.

A new view of the action of electrolytes in affecting the stability of a colloid is suggested, namely, that the salts do not reduce the electric charge on the particle to zero or even to a "critical threshold," but rather that there is a decrease in the thickness of the double layer which allows the particles to approach each other closely enough so that they adhere to each other. "With polyvalent ions, the charge itself may actually be decreased so as to approach zero."

VII. *The temperature coefficient of the ζ-potential*, by H. B. Bull and R. A. Gortner.—The temperature coefficients of the ζ-potential for the interfaces, water-cellulose, 10^{-4} N NaCl-cellulose, and ethyl alcohol-cellulose, between 20° and 51°, were investigated. The ζ-potential at an ethyl alcohol-cellulose interface was found to exhibit a marked positive temperature coefficient. The relationship was shown not to be strictly linear, however, the temperature coefficient varying from approximately 0.31 mv per degree in the range from 23.5 to 30.4° to 0.16 mv in the range 44.9 to 52.1°. The aqueous systems investigated showed a much lower temperature coefficient than the ethyl alcohol-cellulose system. A maximum at about 40° was found for the temperature coefficient for the ζ-potential at both a water-cellulose and a 0.1×10^{-3} N NaCl-cellulose interface.

"For all practical purposes the temperature coefficient of aqueous systems can be ignored in streaming potential measurements made under ordinary laboratory conditions, since in small temperature ranges the temperature effect is much smaller than is the experimental error of the determination."

VIII. *Ion antagonism*, by H. B. Bull and R. A. Gortner.—The surface potentials at interfaces between cellulose and aqueous solutions of sodium, potassium, magnesium, and calcium chlorides, and of mixed solutions of pairs of these salts, up to a total cation concentration of 0.8×10^{-3} of the normal, were measured by means of methods essentially the same as those employed in the early phases of the investigation.

"With the possible exception of $CaCl_2$ and $MgCl_2$, the results obtained for the mixtures of the salts are more or less an average of the results obtained for the salts separately. There is no antagonism between $MgCl_2$ and $CaCl_2$ in

a 0.2×10^{-3} N diluted physiological salt solution. There is no antagonism, as affecting the electrokinetic potential, between KCl and NaCl in the ratio of 20:1, or between NaCl and $CaCl_2$ in the molecular ratio of 100:1."

Studies on electrokinetic potentials.—IX, The electrical field of force at liquid-liquid interfaces, H. B. Bull and R. A. Gortner (*Natl. Acad. Sci. Proc., 17 (1931), No. 5, pp. 288–294, figs. 4; abs. in Minnesota Sta. Rpt. 1931, pp. 41, 42*).—Continuing the work of which the four preceding reports are noted above, the authors devised a streaming potential cell for the measurement of the potentials at interfaces between liquids, and, investigating the effect of changing the distance separating the electrodes, found a position at which the streaming potential was at a maximum. The temperature coefficient was found to be appreciable. "The potentials with solutions of sodium, calcium, and thorium chlorides and sodium stearate against a petroleum oil have been determined, thorium chloride reversing the potential at 5×10^{-6} of the normal concentration. Sodium stearate greatly increased the potential.

"The electrokinetic potential curves at an oil-aqueous solution interface resemble closely electrokinetic potential curves at cellulose-aqueous solution interfaces, glass-aqueous solution interfaces, etc."

Electrokinetic potentials.—X, The effect of particle size on the potential, H. B. Bull and R. A. Gortner (*Jour. Phys. Chem., 36 (1932), No. 1, pp. 111–119, figs. 5*).—In further continuation of the work noted in the abstracts immediately preceding, the authors report electrokinetic measurements on ground quartz in aqueous sodium chloride of a concentration 2×10^{-4} N. In a heterogeneous mixture of quartz particles of various size the streaming potential showed no linear relation to the pressure under which the liquid passed through the quartz diaphragm. Poiseuille's law was found to hold true in this case. On the other hand, "in a more homogeneous mixture of quartz particles a good linear relation was found between the pressure forcing the liquid through the quartz diaphragm and the streaming potential. Between a particle size of 4.59μ and 214μ the surface potential was found to increase roughly as the cube root of the diameter.

"It is suggested that the lack of linearality between the streaming potential and the pressure in a heterogeneous mixture of particle sizes is due to the fact that the smaller particles have a smaller surface potential. It is also suggested that the smaller particles have a smaller surface potential because they adsorb a greater amount of salt per unit area."

Electrokinetic potentials.—XI, The effect of sodium soaps on the electric moment of the double layer at an aqueous-cellulose interface, H. B. Bull and R. A. Gortner (*Physics, 2 (1932), No. 1, pp. 21–32, figs. 2*).—This contribution to the series of reports above noted proposes a change of terminology, as follows: "It is suggested that in interest of clearness and accuracy the attempt to express electrokinetic data in terms of 'potentials' be abandoned, and that the electric moment of the double layer, which does not require a knowledge of the magnitude of the dielectric constant, be substituted for ζ."

Electrokinetic investigations of a general nature similar to that of the work already noted were carried out on aqueous solutions of sodium formate, sodium acetate, sodium propionate, sodium butyrate, sodium caprylate, sodium oleate, and sodium oxalate at a cellulose interface.

"It is indicated that after the fourth carbon atom has been added the electric moment of the double layer is essentially a constant. It is noted that there is no correspondence between the ionization constant of the fatty acid from which the soap is derived and its effect on the electrokinetic conditions at the interface. This indicates that hydrolysis and the resulting OH ion plays a

minor rôle. It is pointed out that the electric moment of the double layer in the case of the longer chained soaps is almost independent of the concentration, whereas that of the short chained soaps [is] much more sensitive to increased concentration. The maximum electric moment is found at about 2×10^{-4} normal. This is true also for a number of salts."

Studies on the electrical charge of bacteriophage, C. E. CLIFTON and R. R. MADISON (*Jour. Bact., 22 (1931), No. 4, pp. 255–260*).—The authors of this contribution from Stanford University determined the electrical charge carried by the bacteriophage by noting the tendency of this agent to climb with water in blotting paper. "The results presented herein indicate that the isoelectric point of the anticoli 'phage tested is around pH 2.9; of antishiga 'phage near pH 3.1; of antistaphylococcus 'phage approximately at pH 3.5; and of antipyocyaneus 'phage below a pH of 2.1."

The behaviour of acid-fast bacteria in oil and water systems, G. B. REED and C. E. RICE (*Jour. Bact., 22 (1931), No. 4, pp. 239–247*).—Acid-fast bacteria in aqueous suspension readily passed from the aqueous to the oil phase when the suspension was shaken with an oil, whereas nonacid-fast forms remained in the water. A variety of fat solvents induced a similar behavior. Passage into the oil was almost complete in the case of the tubercle bacillus; and in the cases of six other acid-fast forms, from 70 to 90 per cent passed from the aqueous to the oil phase. Homologous immune serum, and such emulsifying agents as gelatine and sodium oleate, inhibited the partition in proportion to their concentration. The physicochemical theory relevant to these observations is briefly discussed.

Gum production by Azotobacter chroococcum of Beijerinck and its composition, W. B. HAMILTON (*Jour. Bact., 22 (1931), No. 4, pp. 249–254*).—The organism named produced a gum in the presence of various carbohydrates in the culture medium, the more complex compounds being more readily available for conversion into gum than were the mono- and disaccharides. Peptone increased gum production but was not found essential to it. Gum was not found to be produced in a solution of peptone alone.

The gum formed appeared to be one of the higher carbohydrates. It was l-rotatory, and did not yield substances capable of reducing Fehling's solution when it was boiled in acid solution. A trace of nitrogen found in the preparations examined is attributed to remains of bacterial cells not removed in the purification. "The results of the analysis place the gum in 'Class I' of Haas and Hill [E. S. R., 48, p. 801], and under this classification it would be termed an arabin."

Mechanical spinner for Esmarch cultures, H. GEE (*Jour. Bact., 24 (1932), No. 1, pp. 35–41, figs. 2*).—A comparatively simple device, described in a contribution from the University of California, provides for a rotation of the tubes by means of a stirrer motor about their long axes in a vertical position in a vessel of which the bottom is provided with a bearing for the lower end of the test tube; the outer vessel being capable of being filled with ice water to solidify the agar film distributed by centrifugal force on the walls of the tubes.

Adsorption experiments with the virus of vaccinia, F. F. TANG (*Jour. Bact., 24 (1932), No. 2, pp. 133–143*).—It was demonstrated that the virus could easily be adsorbed from the saline suspension but not from a hormone broth. Pyrex was found definitely less adsorptive than fragments of ordinary glass, and sand was practically nonadsorptive. The inferiority of sand when used as a grinding material could not, therefore, be attributed to adsorption.

Physico-chemical studies on proteins.—II, Alkali binding. A comparison of the electrometric titration of proteins and of phosphoric acid

with sodium and calcium hydroxides, W. F. Hoffman and R. A. Gortner (*Jour. Phys. Chem., 29 (1925), No. 7, pp. 769–781, figs. 7*).—This paper of the series contributed from the Minnesota Experiment Station (E. S. R., 54, p. 801) presents the conclusions, drawn from determinations of the titration curves of fibrin, casein, teozein, and durumin, together with those of phosphoric acid, against both sodium hydroxide and calcium hydroxide, that curves of the same type are obtained when a protein is titrated with either sodium hydroxide or calcium hydroxide; and that the titration curves of protein+alkali and of phosphoric acid+alkali are not identical at similar H-ion concentrations with the curves formed by a subsequent "back titration" with hydrochloric acid. There was a "lag" in the back titration curves.

When phosphoric acid was titrated with sodium hydroxide and calcium hydroxide, the two curves were not similar. In the latter case, both the secondary and tertiary hydrogens were replaced by calcium at a pH the same as that at which disodium phosphate was formed. All three hydrogens of phosphoric acid may be titrated by calcium hydroxide below a pH of 8.0. The bearing of this observation on the graphic structure of dicalcium phosphate and tricalcium phosphate is discussed. "Tricalcium phosphate is apparently stable in solutions as acid as pH 6.5. This has important bearings on physiological and biochemical problems."

Physico-chemical studies on proteins.—III, Proteins and the lyotropic series, R. A. Gortner, W. F. Hoffman, and W. B. Sinclair (In *Colloid Symposium Monograph, V*, edited by H. B. Weiser. *New York: Chem. Catalog Co., 1928, vol. 5, pp. 179–198, fig. 1*).—As the third in the series of investigations noted above, the authors made a study of the peptizing effect upon the proteins of wheat flour of aqueous solutions of 21 inorganic salts. The effects of most of these salts were observed in concentrations ranging from 0.5 N to 2.0 N. There appeared to be a pronounced lyotropic or Hofmeister series of anions, these arranging themselves in the order of increasing peptizing effect, $F<SO_4<Cl<$tartrate$<Br<I$; together with a less pronounced, but still distinct, lyotropic series of cations, in the order of increasing peptization, $Na<K<Li<Ba<Sr<Mg<Ca$. Hydrogen-ion concentration differences did not appear adequate to account for these lyotropic series. The lyotropic effects were found due to the properties of the anion and cation of the salt and were observable and measurable even at constant H-ion concentration. The alkali halides all caused decreasing peptization with increased salt concentration. The halides of the alkaline earths as a rule caused increased peptization with increasing salt concentration. This was observed particularly in the case of $MgCl_2$, $MgBr_2$, $SrCl_2$, and $CaBr_2$ solutions.

"Our data show that protein 'solubility' in neutral salt solutions is, in reality, protein peptizaton, and as such it is governed as to rate and extent by the nature of the particular anions or cations present in the salt solution.

"Inasmuch as globulins are defined as 'proteins soluble in dilute solutions of salts of strong acids with strong bases' we wish to raise the questions, what salts, what dilutions, and lastly, what is a globulin? Our data show that N/1 solutions of KF extract an average of 13 per cent, KCl 23 per cent, KBr 37 per cent, and KI 64 per cent of protein from wheat flours. Which salt extracts the globulins? We do not believe that any salt used, in any one of the concentrations, extracts a chemical entity which should be designated by the term 'globulin.'"

Peptization by neutral salt solutions was not shown to involve hydrolysis, in that there was no increase in free amino or carboxyl groups. "It is pointed out that the colloid chemical viewpoint still affords the most satisfactory explanation for many of the properties of protein systems."

Physico-chemical studies on proteins, IV–VI (*Jour. Phys. Chem., 34 (1930), No. 5, pp. 1071–1101; 35 (1931), No. 6, pp. 1565–1605, figs. 2, abs. in Minnesota Sta. Rpt. 1931, pp. 37, 38; 36 (1932), No. 7, pp. 1857–1881, fig. 1*).—These three further contributions to the series noted above report some chemical and physico-chemical characteristics of edestin, arachin, and the globulin of the cantaloupe seed, and of deaminized edestin, arachin, durumin, casein, and fibrin; a study of the peptizing effect of certain inorganic salts on the proteins of a number of seeds and grains; and further experiments on the combination of bases with proteins under conditions varied with respect to H-ion concentration, and on the effect of neutral salts upon such combination.

IV. *A comparative study of the acid and alkali binding of native and deaminized proteins*, by W. M. Sandstrom.—In the case of the deaminized proteins the free amino group of lysine was attacked by the nitrous acid with the result that the lysine fraction was lost from the phosphotungstic acid fraction, histidine and cystine appearing to be "slightly altered" by the treatment with nitrous acid.

Varying concentrations of acid and alkali were added to the proteins and potentiometric determinations of the H-ion concentrations were made on the system at equilibrium. The proteins behaved very similarly to the prolamines previously studied. Except in the case of edestin, the quantity of acid bound by the proteins was roughly proportional to their lysine content. The acid-binding capacity of all of the five proteins studied was greatly decreased when the proteins were deaminized.

In four of the five cases more sodium hydroxide was needed to bring the deaminized protein to the hydroxyl-ion concentration represented by pH 10.5 than was required for the untreated protein. "From the data beyond the range of pH 2.5 and 10.5 the constants, log a and b, were calculated from the logarithmic values. The constants for the globulins and the group of deaminized proteins differ amongst themselves but are very similar to the values obtained in this laboratory for the prolamines, except that the values for b, the slope of the line, for the globulins are uniformly lower than those for the prolamines. As in the case of the prolamines this latter type of binding can not be accounted for on the basis of primary valences, and since the empirically derived Freundlich adsorption isotherm can be made to fit the data, we conclude that in these regions we are dealing with typical adsorption phenomena."

V. *A comparative study of the peptization of the protein complex in various seeds and grains*, E. V. Staker and R. A. Gortner.—With reference to the peptization behavior of most of the seed protein complexes, a definite lyotropic or Hofmeister series of anions was observed, the peptizing effect of 0.5 M solutions of various salts on the proteins of 28 seeds and grains having been investigated. Barley, oats, and all of the varieties and types of wheats studied gave the same lyotropic series, the anions arranging themselves in the order of increasing peptization effect of $F<SO_4<Cl<Br<I$. Some variation was found in the case of the legume seeds. Considering the halogens alone, "the order is essentially $F<Cl<Br<I$."

The lyotropic order for the pea, however, was $SO_4<Cl<F<Br<I$. Of the Cruciferae, radish and rape meals had the lyotropic order of anions of $F<SO_4<Cl<Br<I$; mustard meal, $F<I<SO_4<Br<Cl$. The lyotropic effect in the case of corn, millet, sorghum, and teosinte meals was much less pronounced than that found for the other seeds. Brazil nut meal and hemp meal had a lyotropic order of anions of $F<Cl<SO_4<Br<1$; flax meal, $F<Cl<I<Br<SO_4$; and sunflower meal, $F<SO_4<Cl<Br<I$.

"In conclusion it is emphasized that protein 'solubility' is in reality protein peptization, and that the technic which is employed may largely determine the

yield and the properties of the protein complex which is isolated. The existence of true plant 'albumins' as definitely characterized chemical entities is questioned. The available evidence indicates that many of the preparations which have hitherto been regarded as homogeneous and distinct plant proteins may in reality either be heterogeneous mixtures or else merely fragments of a larger and more complex protein micelle."

VI. *The effect of salts on the casein-sodium hydroxide and paracasein-sodium hydroxide equilibria*, A. D. Robinson, R. A. Gortner, and L. S. Palmer.—The quantity of sodium hydroxide bound by casein and paracasein increased with the equilibrium pH, suggesting that adsorption may be involved.

The amount of sodium hydroxide bound by casein and paracasein was increased by the presence of potassium chloride, potassium bromide, or potassium iodide. The addition of neutral salts also caused a shift in the equilibrium pH of a casein-NaOH or a paracasein-NaOH system toward a lower pH value. This salt effect was much more pronounced in these protein-base systems than has been reported in the case of simpler acid-base systems. Concentrations of neutral salts, as low as 0.001 N in some instances, produced a measurable pH shift.

The magnitude of the salt effect was essentially the same for potassium chloride, potassium bromide, and potassium iodide, this salt effect exhibiting no marked lyotropic series for these anions. The protein-NaOH systems were more sensitive to the addition of salts at a pH value closer to their isoelectric points than at one farther away.

"This 'salt effect' must be taken into consideration in the interpretation of the electrometric titration curves of proteins. If one titrates proteins electrometrically with either acid or alkali and then back-titrates the resulting system, the back-titration curve, due to the salt effect, will not coincide with the original titration curve. If a protein solution contains even small quantities of neutral inorganic salts, the equilibrium pH which is attained on the addition of a definite quantity of acid or alkali will be different from that which would be attained in the absence of the neutral inorganic salts. . . .

"This study affords evidence that a strictly classical thermodynamical treatment of the data of protein systems does not indicate a 'maximum binding capacity' of NaOH by either casein or paracasein, such as is a necessary consequence of a stoichiometrical salt formation, uncomplicated by adsorption reactions. The amount of sodium hydroxide which is bound by either casein or paracasein increases with increasing equilibrium hydrogen-ion concentration in spite of attempts to apply assumptions of a strictly stoichiometrical combination to the calculation of the data."

Proteolysis in bread doughs, W. E. Brownlee and C. H. Bailey (*Cereal Chem., 7 (1930), No. 5, pp. 487–517, figs. 12; abs. in Minnesota Sta. Rpt. 1931, p. 29*).—A rather elaborate series of experiments on doughs and other original flours, reported in full experimental detail, led to the conclusion that fermentation does not affect the chemical structure of the gluten proteins so far as could be detected by any methods used.

Relation of the overgrinding of flour to dough fermentation, L. P. Karacsonyi and C. H. Bailey (*Cereal Chem., 7 (1930), No. 6, pp. 571–587, figs. 5; abs. in Minnesota Sta. Rpt. 1931, p. 30*).—The overgrinding of wheat flours substantially increased their diastatic activity as measured by the Rumsey autolytic method (E. S. R., 48, p. 504). The magnitude of the proportional increase was in inverse ratio to the initial diastatic activity of the untreated flour.

Gas production and gas retention in freshly mixed doughs, and in doughs previously fermented for three hours, were not substantially modified by the

overgrinding. This observation is considered to indicate that the Rumsey method may fail at times as a basis for the estimation of the fermentation possibilities of a wheat flour as measured in terms of gas production, of gas retention, or of fermentation tolerance.

A study of the hydrolysis of corn starch, D. LIFSCHITZ (*Diss., Columbia Univ., New York, 1931, pp. 24+[2]*).—This paper deals with the hydrolysis of α- and β-amyloses of corn starch by acid of low concentration acting at a high temperature.

Suspensions of corn α-amylose in concentration equal to that of its occurrence in the whole starch yielded, under the treatment specified, solutions of a specific rotation lower than that of glucose. Glucose solutions of concentration equivalent to these showed an increase in rotatory power over the original value under the same conditions. "Since whole starch hydrolyzed in this manner yields some gentiobiose, and since the disaccharide has $[\alpha]_D = +9.8°$, the low rotations of the corn α-amylose products may be attributed to it."

Corn β-amylose in concentration equal to its occurrence in the whole starch under the same treatment forms solutions of specific rotation higher than that of glucose. Gentiobiose was found to be synthesized from glucose under the conditions of these hydrolyses.

"Experiments have shown that, other conditions equal, the extent to which glucose condenses to form polysaccharides depends only on the initial concentration of glucose. The treatment of whole corn starch, the α-amylose and the β-amylose in amounts such that the total available glucose is the same, shows that β-amylose is hydrolyzed more rapidly than whole starch and α-amylose less rapidly. Hence the concentration of glucose available, at any time, for concurrent synthesis is greatest for β-amylose and least for α-amylose. The yield of gentiobiose from the former may therefore be used as a measure of whatever synthesis occurs during the hydrolysis of the polysaccharides.

"The yield of gentiobiose from whole starch is significantly greater than from β-amylose. The excess may have been produced by direct hydrolysis of the α-amylose in the whole starch. . . . Some gentiobiose types of linkings may tentatively be considered present in corn α-amylose and absent from corn β-amylose." The fatty acids liberated in the hydrolysis of whole corn starch and corn α-amylose did not appear to affect the course or extent of the reaction.

The racemization of acetyl-*l*-tryptophane, V. DU VIGNEAUD and R. R. SEALOCK (*Jour. Biol. Chem., 96 (1932), No. 2, pp. 511–517*).—This contribution from the University of Illinois presents data demonstrating that an aqueous solution of the sodium salt of acetyltryptophane is racemized by acetic anhydride at 35 to 40°, and that the product isolated by Berg in his acetylation of *l*-tryptophane is actually the acetyl-*dl*-tryptophane. Acetyl-*dl*-tryptophane was resolved by means of the *d*-α-phenylethylamine salt, with the result of the isolation of acetyl-*d*-tryptophane. Acetyl-*l*-tryptophane was prepared also by the acetylation of *l*-tryptophane by means of the Schotten-Bauman reaction with acetic anhydride.

"The necessity of having sufficient alkali present to decompose the excess acetic anhydride in a Schotten-Bauman reaction where acetic anhydride is used as the acetylating agent has been pointed out. Opportunity is otherwise afforded for racemization. Instances in the literature where insufficient alkali was employed have been indicated."

The titration constants of α, β-diaminopropionic acid and their relation to the constants of various isomers, J. P. GREENSTEIN (*Jour. Biol. Chem., 96 (1932), No. 2, pp. 499–510, figs. 2*).—Comparing the titration constants of α, β-diaminopropionic acid with those of α, δ-diaminovalerianic acid and of α,

ε-diaminocaproic acid, the author of this contribution from the Harvard Medical School found his data to reveal a progressively acid character of the molecule as the distance between amino groups diminished. The MacInnes equation, according to which the logarithms of the dissociation constants vary proportionately as the reciprocal of the number of carbon atoms separating the charged groups from each other, was used in comparing these diamino acids with substances of analogous constitution. The constant of proportionality appeared identical in the case of substances influenced by the same substituted group, and was apparently independent of the nature of the ionizing group.

Transmission spectra of dyes in the solid state, W. C. Holmes and A. R. Peterson (*Jour. Phys. Chem., 36 (1932), No. 4, pp. 1248–1254, fig. 1*).—This contribution from the U. S. D. A. Bureau of Chemistry and Soils records the transmission spectra of dry films of 32 dyes of the azo, triphenylmethane, and xanthene groups. The data indicate a high degree of molecular aggregation in the solid dyes. Solution displaced the absorption bands toward the shorter wave lengths. The work yielded new evidence bearing upon the occurrence and degree of tautomerism in dyes.

"The outstanding modifications in spectra which occur when dyes are dissolved are (1) a shifting in the spectral location of the absorption band, attended by (2) evidences of increasing molecular dispersion and, frequently, by (3) evidences of tautomeric alteration in the dye. The first of these phenomena, however, also occurs in passing from one solvent to another, and evidences of increasing dispersion and of tautomerism which are of the same type, if not of equal degree, are often observed upon the mere dilution of aqueous dye solutions." See also a previous note (E. S. R., 67, p. 654).

The influence of hydrogen ion concentration on the properties and activity of invertase, A. H. Palmer (*Diss., Columbia Univ., New York, 1930, pp. 48+[5], figs. 7*).—This experimental work supported the assumptions that invertase is a protein and is subject to the same laws which govern the behavior of hydrophilic sols, and that the efficiency of the enzyme as a catalyst depends upon the imbibition of water. An apparent parallelism between the activity of invertase on the one hand and the physicochemical properties of a gelatin sol on the other was indicated.

"Further, if this parallelism exists, it might be expected that at a pH of 6 or 7 where the imbibition of water should be greater than at the optimum the enzyme would be more efficient. This is precisely as is indicated by the change in slope of the pS-activity curve, by the decreased retardation due to excess sucrose, and by the decrease in coagulative power of alcohol. In this respect it is interesting to note that the ratio of the retardations at the optimum to those at a pH of 6.3 to 6.4 is practically the same for the two retardants alcohol and excess sucrose. This would lend weight to the supposition that some change in the efficiency of the enzyme itself is brought about by a change in the hydrogen-ion concentration rather than to the view that these phenomena are due to some specific property of the retardants in question."

Studies on rennin.—I, The purification of rennin and its separation from pepsin. II. The isolation of prorennin, H. Tauber and I. S. Kleiner (*Jour. Biol. Chem., 96 (1932), No. 3, pp. 745–753, 755–758*).—These two papers present an account (1) of the preparation of an extremely active rennin free of peptic activity (obtained from an extract of the fourth stomach of the calf by fractional isoelectric precipitation, its composition and characteristics showing that rennin is a thioproteose, differing in numerous properties from pepsin); and (2) of experimental evidence "which proves the existence of a precursor of rennin. The precursor has been isolated in a water-soluble dry form, free of rennet activity."

The production of vitamin D in a glow discharge, F. A. Askew, R. B. Bourdillon, and T. A. Webster (*Biochem. Jour., 26 (1932), No. 3, p. 814*).—A brief report is given of experiments showing that vitamin D can be synthesized from ergosterol in a glow discharge. The yield per unit of electric energy was much smaller, however, than that obtained with a mercury vapor lamp.

Quantitative methods in vitamin assays (*Nature [London], 129 (1932), No. 3257, pp. 514, 515*).—This review deals with the report of Bourdillon et al. on the quantitative determination of vitamin D noted above, of Key and Elphick on vitamin C (E. S. R., 67, p. 189), and of Coward et al. on vitamin A (E. S. R., 67, p. 200).

A temperature control closet for adiabatic calorimetry, B. C. Hendricks and W. H. Steinbach, jr. (*Jour. Phys. Chem., 36 (1932), No. 4, pp. 1279–1281, fig. 1*).—The design of the apparatus described and illustrated is a contribution from the University of Nebraska. A satisfactory temperature control was obtained and, "after having fixed the calorimeter in the bath with its sample tube loaded, the electromagnetic trip and thermometer tapper adjusted, it is possible for the experimenter to start the stirring motor, vary the heating or cooling rate, illuminate the thermometers, release the sample, tap the thermometer, all by means of switches and without opening doors or even moving from his seat."

Filtration technic, H. Gee (*Jour. Bact., 24 (1932), No. 1, pp. 29–34, fig. 1*).—A Berkefeld filtration set-up for the more convenient and safer treatment of quantities of liquids amounting to several liters is contributed from the University of California, directions for assembly and operation being accompanied by drawings showing constructional details.

An improved reagent for the acetyl-methyl-carbinol test, E. Leifson (*Jour. Bact., 23 (1932), No. 4, pp. 353, 354*).—The addition of 0.1 per cent copper sulfate dissolved in strong ammonia solution to the 10 per cent or stronger sodium hydroxide of the Voges-Proskauer test rendered the reagent more sensitive to acetyl-methyl-carbinol. The rate of the reaction was found so greatly increased that a bright red coloration appeared in from 10 to 20 minutes.

Interaction between ammonia and soils as a new method of determining the state of saturation and pH values of soils, A. N. Puri (*Soil Sci., 33 (1932), No. 5, pp. 397–403*).—The quantity of ammonia taken up by a natural soil was determined by placing from 10 to 20 g of the soil in a dish over a normal solution of ammonia in a vacuum desiccator and maintaining this exposure for two days, after which the soil was transferred to another desiccator in which it was kept over 90 per cent sulfuric acid for a further two days. The ammonia retained by the soil was then determined by means of the usual distillation with lime followed by titration. To determine the maximum saturation capacity of the soil for ammonia, the author stirred 10 g of the soil with about 50 c c of water, added enough 0.2 N hydrochloric acid to decompose the carbonates, and, after cessation of all effervescence, washed the soil free of all calcium extractable by 0.05 N hydrochloric acid, washed free from all chlorides removable by distilled water, and dried the sample by an extraction with a little alcohol followed by air drying; this acid-treated soil being then exposed over ammonia and over sulfuric acid as above described. "The state of saturation of the soil (V) is calculated from the formula

$$(V)=\frac{100\ (T-S)}{T}$$

where S and T are the amounts of ammonia taken up by the natural and acid treated soil, respectively. All quantities, of course, are expressed in equivalents."

From the values of degree of saturation thus obtained, it is shown to be possible to calculate the lime requirement as well as the approximate pH value of a soil.

Measuring the salinity of irrigation waters and of soil solutions with the Wheatstone bridge, C. S. Scofield (*U. S. Dept. Agr. Circ. 232 (1932), pp. 16, figs. 3*).—Following a brief introductory statement, the circular takes up the apparatus used and its assembly and operation, the importance of temperature compensation and the means used for avoiding error from this source, the design and operation of the duplex conductivity cell, soil cups, the interpretation of conductance measurements, and the conductance of saturated soil.

The duplex conductivity cell was designed to be used in the absence of a suitable water bath. It consists of two immersion conductivity cells, mounted side by side in a disk of hard rubber, designed to fit into the top of a cylindrical fruit jar of 1 qt. capacity. One of the conductivity cells has a small opening at the bottom and another at the top so that it will be filled with the water sample when placed in the jar. The other conductivity cell is closed at the bottom and open at the top through a small tubulature which may be closed with a rubber stopper. The closed cell is filled with the reference solution.

A critical laboratory review of methods of determining organic matter and carbonates in soil, L. T. Alexander and H. G. Byers (*U. S. Dept. Agr., Tech. Bul. 317 (1932), pp. 26, fig. 1*).—A study of the organic matter content of a group of soils by the hydrogen peroxide method, the dry-combustion method, and the modified Rather method (E. S. R., 39, p. 11) is presented, together with a discussion of the defects of each method. The conclusion reached is that none of these methods gives a satisfactorily accurate means of estimating the organic matter in soils. The modified Rather method appeared to come nearest to the objective sought, but it was found too slow and expensive for ordinary routine examinations.

The fact that the dry-combustion method is based on a fundamentally inaccurate conversion factor does not invalidate its use for accurate determination of carbon content is pointed out. The need for careful consideration of the carbonate content of soils as a part of the procedure in determining the carbon content of soils is emphasized, and an improved procedure is suggested.

An iodometric micro method for the determination of sulfates in biological material, S. Morgulis and M. Hemphill (*Jour. Biol. Chem., 96 (1932), No. 3, pp. 573–583*).—This contribution from the University of Nebraska describes a method for determining sulfates by precipitation with barium chromate and the iodometric titration of the equivalent of chromic acid set free. The phosphates required first to be removed. In the absence of organic matter this procedure was found rapid, reliable, and suitable for the determination of very small quantities of sulfur.

The material, freed from phosphates by means of solid $Ca(OH)_2$, was digested with fuming nitric acid and superoxol. On dissolving the ash the sulfates could be determined very quickly by the precipitation with $BaCrO_4$ and the iodometric titration of the chromic acid.

"To determine the inorganic sulfates in biological material it is not sufficient, however, to remove only the phosphates, as there are other interfering substances, especially uric acid, which must be removed. This is accomplished by a mild preliminary oxidation with superoxol and a trace of $FeCl_3$. . . . For the total base determination the phosphates are removed according to Fölling's procedure with metastannic acid, and the dry ashed residue, dissolved in acidulated water, is treated in the same way."

The determination of zinc in biological materials, W. R. Todd and C. A. Elvehjem (*Jour. Biol. Chem., 96 (1932), No. 3, pp. 609–618*).—The method de-

scribed in this contribution from the University of Wisconsin is based on the precipitation of zinc, after its separation from the other elements present in the ash solution, as zinc ammonium phosphate. The procedure used for the separation of zinc was a modification of that involving the coprecipitation of zinc with added copper as the sulfide at a definite pH to eliminate the bulk of the impurities; with a second precipitation under identical conditions to remove the remaining impurities; and a final separation of the copper and zinc. The sulfide precipitates were separated by centrifugation rather than by filtration after long standing. Further, the oxidation of the sulfides was carried out by means of hydrogen peroxide in HCl solution rather than by the use of nitric and hydrochloric acids. "This change eliminates the need for several evaporations to insure the complete removal of nitric acid."

Of the results of a study of the precipitation of zinc ammonium phosphate with a view to the standardization of the procedure for quantitative determinations in solutions containing only minute quantities of the element, it is stated that "when diammonium hydrogen phosphate is used as the precipitating reagent the zinc ammonium phosphate comes down first as an amorphous compound which upon standing changes into a crystalline salt of the composition $ZnNH_4PO_4$. At definite pH values and definite concentrations it was found that the zinc could be carried down with practically no loss."

A new triple acetate method for sodium determinations in biological materials, P. W. Salit (*Jour. Biol. Chem., 96 (1932), No. 3, pp. 659–672*).—In this method the sodium salt is precipitated with alcohol in a 15-c c tube, and the precipitate is centrifuged and washed with glacial acetic acid saturated with the triple salt. The sodium in the precipitate is estimated either gravimetrically or colorimetrically, according to the quantity of precipitate.

"The optimum quantity of sodium for the colorimetric procedure is approximately 0.3 mg. However, satisfactory results, with an experimental error of only 2 or 3 per cent, may be obtained with as little as 0.05 mg of sodium. The method is adapted, without resort to dry ashing, to sodium estimations in biological materials such as serum, whole blood, urine, tissue, stools, and ocular humors."

The determination of magnesium in blood with 8-hydroxyquinoline, D. M. Greenberg and M. A. Mackey (*Jour. Biol. Chem., 96 (1932), No. 2, pp. 419–429*).—As a contribution from the University of California Medical School the authors report modifications of method including the use of oxalated samples to avoid interference by calcium, filtration on a Kirk-Schmidt micro filter (noted below) to avoid the losses likely to occur in separating magnesium 8-hydroxyquinoline by centrifugation, and the bromination of the precipitated hydroxyquinoline compound in the presence of a considerable excess of bromate to insure a rapid and smooth bromination.

An improved technic for micro calcium analysis, P. L. Kirk and C. L. A. Schmidt (*Jour. Biol. Chem., 83 (1929), No. 2, pp. 311–314, fig. 1*).—A modification of the oxalate precipitation procedure for calcium determination is described by the authors of this contribution from the University of California, together with a micro filter of which the construction is essentially as follows:

As indicated by a drawing, a section of ¾-in. tubing is tapered from a point about 1 in. from the top and joined to about ¼ in. of ⅜-in. tubing, which, in turn, is joined through a nearly square shoulder to a stem of tubing about ⅛ in. in diameter and about 1 in. in length. A ⅜-in. circular plate of platinum foil, cut out with a cork borer and perforated, rests on the shoulder. The apparatus is prepared for use by forming a thin pad of purified asbestos on the platinum foil plate. After the filtering off and washing of the precipitate, the entire pad

is removed by inserting a small stirring rod at the bottom and rinsing down the loosened pad (in the case of the calcium oxalate precipitate here dealt with, the rinsing is done first with hot water, then with hot 2 N sulfuric acid). In the case of very small precipitates of calcium oxalate, solution may be effected in situ by means of the sulfuric acid solution.

The determination of carotin in flour, C. G. Ferrari and C. H. Bailey (*Cereal Chem., 6 (1929), No. 4, pp. 347–371, figs. 2; abs. in Minnesota Sta. Rpt. 1931, p. 17*).—This contribution from the Minnesota Station reports upon an adaptation of the gasoline color value method permitting a color determination by means of the spectrophotometer more exact than that obtained, by the use of a colorimeter, in the original form of the method.

The accuracy of fat determinations in buttermilk, and the effect thereon of the presence of lecithin, J. Lyons and W. Finlay (*Roy. Dublin Soc. Econ. Proc., 2 (1932), No. 28, pp. 445–459*).—In tests at the dairy technology department, University College, Cork, it was found that the Roese-Gottlieb method gave higher fat tests with buttermilk than the Gerber method, with the difference decreasing slightly as the lactation period advanced. The Gerber test gave higher results than the Minnesota test (E. S. R., 63, p. 506), the difference increasing with advancing lactation, indicating that the lecithin content of buttermilk was higher toward the end of the lactation period.

Adding lecithin increased the Roese-Gottlieb and Gerber tests, but did not affect the Minnesota test. About 70 per cent of the added lecithin was recovered by the first two methods. The Gerber test indicated and the Minnesota test clearly showed that the average fat loss in buttermilk was higher in summer than in winter. An increased stability of the lecithin and fat in the milk emulsions during the winter period was indicated.

The authors suggest a shortened method for the Roese-Gottlieb test for buttermilk.

Quantitative determination of calcium, magnesium, and phosphorus in feedstuffs and cattle excreta: Improved technic, H. P. Morris, J. W. Nelson, and L. S. Palmer (*Indus. and Engin. Chem., Analyt. Ed., 3 (1931), No. 2, pp. 164–167; abs. in Minnesota Sta. Rpt. 1931, p. 36*).—In the case of samples of which the ash contained a large proportion of substances insoluble in hydrochloric acid, the authors obtained higher results in the determinations named when the ash was first fused in a platinum dish with sodium carbonate, then dissolved for analysis in dilute hydrochloric acid. The silicic acid did not interfere with the volumetric determination of calcium, but it required to be removed by dehydration to permit a gravimetric calcium determination. The procedure is described in working detail, and results obtained by its means are compared with those given by other methods.

The acid-insoluble constituents of the ash are believed to be complex silicates involving the elements which it was desired to determine, but capable of being broken up completely by the fusion with sodium carbonate.

New uses for farm products (*U. S. Dept. Agr. Yearbook 1932, pp. 513–524, fig. 1*).—This general caption covers brief articles on the following topics: Chemical Utilization of Farm By-Products Has Large Prospects, by C. A. Browne (pp. 513–517); Citrus By-Products Market Is Growers' Safeguard in Years of Overproduction, by E. M. Chace (pp. 517, 518); Lignin, Farm By-Product, Now Wasted, May Supply Cheap Organic Chemicals, by M. Phillips (p. 519); Furfural, a Product of Farm Wastes, Has Many Industrial Uses, by H. T. Herrick (p. 520); Utilization of Straws and Stalks Lags as Other Materials Compete, by F. P. Veitch (pp. 521, 522); and Sweetpotatoes Yield Fine White Starch by a New Process, by R. T. Balch and H. S. Paine (pp. 522–524).

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AGRICULTURAL METEOROLOGY

Report of the chief of the Weather Bureau, 1930–31 (*U. S. Dept. Agr., Weather Bur. Rpt. 1931, pp. V+250, pls. 7*).—This report, following the same plan as in previous years, gives a general summary of weather conditions of each month of 1930, brief summaries of data regarding tornadoes, hail, losses from windstorms, sunshine, and excessive rainfall during the year, and detailed tabulations of data for pressure, temperature, precipitation, humidity, cloudiness, wind, and evaporation throughout the United States.

Reference is made to the bureau's investigations of possibilities of extending the period of forecasts "without as yet having found a sufficiently sound basis yielding possibilities of successful forecasting." The findings of a committee of experts appointed to determine how droughts should be defined and their characteristics classified are briefly given. Drought was defined by this committee as "a lack of rainfall so great and long continued as to affect injuriously the plant and animal kingdoms and to deplete water supplies both for domestic purposes and for the operation of power plants, especially in those regions where the rainfall is normally sufficient for such purposes."

Monthly Weather Review, [March-April, 1932] (*U. S. Mo. Weather Rev., 60 (1932), Nos. 3, pp. 83–100, pls. 11; 4, pp. 101–115, pls. 7*).—These numbers contain detailed summaries of climatological data and weather conditions, solar and aerological observations, observations on weather on the Atlantic and Pacific Oceans, and bibliographical and other information. Beginning with the March number, special contributions are omitted because of reduced funds for printing the *Review*.

Relative humidity (*U. S. Dept. Agr., Weather Bur., 1932, pp. II+14*).—Tables are given which show values of relative humidity, or percentage of saturation, for air temperatures from −39° to +44° C. and for depressions of the wet-bulb thermometer at 0.1° intervals computed for a barometric pressure of 29.24 in. (990 mb.), which is approximately the average station pressure for many stations in the United States not lying in mountainous or plateau regions, and corrections for effect of barometric pressures differing from 29.24 in.

A comparison of temperatures in widely different environments of the same climatic area, R. N. Chapman, R. E. Wall, L. Garlough, and C. T. Schmidt (*Ecology, 12 (1931), No. 2, pp. 305–322, figs. 7; abs. in Minnesota Sta. Rpt. 1931, p. 19*).—"The mean air temperatures of the hottest portion of the year are shown to be very nearly the same for sand dunes, pine, oak, tamarack bog, and basswood-maple forests in the region of the forty-fifth parallel in Minnesota. Extremes of air and soil surface temperatures show significant differences."

Agricultural significance of climatic features at Goodwell, Oklahoma, H. H. Finnell ([*Oklahoma*] *Panhandle Sta., Panhandle Bul. 40 (1932), pp. 45, pls. 2, fig. 1*).—This bulletin summarizes and discusses, with reference to their agricultural significance, observations on pressure, temperature, precipitation, humidity, evaporation, sunshine, and wind recorded at the station, 1928–1931.

The mean annual precipitation for the period was 17.88 in., 77.5 per cent of which fell during the frost-free period and "9.9 in. annually coming at a rate most effective for replenishing soil moisture supplies, 5.57 in. in showers too light to increase soil moisture but of value in mitigating atmospheric conditions, and 2.43 in. which was subject to loss by surface run-off."

The mean annual temperature was 55° F., the seasonal trend being a relatively gradual rise from January through June with the maximum maintained through August and a more rapid decline beginning in September and reaching

the minimum during the latter part of December. The average daily range was 30.6°. "The highest temperature recorded at Goodwell was 107° and the lowest —16°. Mean maximum temperatures of 90° and higher prevailed in July and August, but the low humidity of the air and constant wind prevented them from being oppressive. Mean minimum temperatures of below freezing extended through the period November to March, inclusive. Periods of extremely low temperatures were usually of short duration, and the storms though frequent rarely brought heavy falls of snow. . . . The average length of frost-free period was 187.5 days. The average date of the last killing frost in the spring was April 17 and that of the first killing frost in the fall was October 23," but showed over a period of 22 years a variation of 46 days in the spring and 30 days in the fall.

The mean relative humidity for the period, 1928–1931, was 61.1 per cent, ranging from 7 to 100 per cent. The average annual evaporation was 65.9 in., being six times as great during the summer as in winter. "The rate of evaporation appeared to be a better index of crop-producing conditions than did rainfall." The average number of clear days per year was 225, partly cloudy 68, and cloudy 72. The estimated possible sunshine was 72.5 per cent.

The choice of productive crops is narrowly limited by the prevailing temperature conditions and the low frequency and erratic distribution of rainfall, resulting in injurious droughts. "The sorghums embody the advantages both of high yield and dependability to perhaps the highest possible degree. . . . Winter grains (wheat and barley) with a productive capacity rivaling that of the sorghums do not have a record of high dependability. . . . The spring grains (barley, oats, and wheat) have been more or less severely limited by the amount and sometimes practically prohibited by the distribution of spring rainfall. Short season varieties of barley and oats have been more consistent producers than spring wheat. Corn has been low and unreliable in production." The growing season is as a rule too short for cotton. Tepary and mung beans, cowpeas, soybeans, and related annual legumes have been found valuable for hay, but are often limited in yield by insufficient rainfall. Millet appears to be well adapted to the climatic conditions, but is rarely used because of its low yield. "The sour cherry and cherry-plum hybrids are the principal tree fruits which can be depended upon to escape the frosts. Grapes and certain of the berries are dependable producers, but are so frequently limited by amount of rainfall that supplementary irrigation is considered necessary."

Weather and cotton yield in Texas, L. H. Daingerfield (*Bul. Amer. Met. Soc., 13 (1932), No. 4, pp. 67–69*).—It is stated that the tropical origin of cotton is shown in its tolerance of heat and marked intolerance of cold. Cottonseed should not be planted until the soil reaches a mean temperature of 62° F., which, in a normal season, may not be reached until a month or six weeks after the last killing frost of spring. The planting period in Texas during a normal year may range from late February in the lower Rio Grande Valley to the middle of May in the northwestern part of the State. Sustained high temperatures both night and day throughout the season, with a summer mean of not less than 77°, are most favorable for the growth of the cotton plant.

"Other things being equal, the ideal year for cotton would be one in which there was good soil moisture storage during the preceding winter, which should be sufficiently cold to destroy the hibernating pests; followed by an early spring of moderate rainfall, promoting planting and cultivation of crop; a moderately dry, hot summer, with abundant sunshine, but not really droughty and not subject to sharp reversals in rainfall or temperature, thus favoring care and growth of crop and holding down weevil (this condition would favor certain other insects, however, of less serious nature); finally, a fairly dry,

bright autumn and late frost, to remove all of the cotton from the fields without deterioration or loss."

SOILS—FERTILIZERS

History of A, B, and C soil horizons, C. C. Nikiforoff (*Amer. Soil Survey Assoc. Bul. 12 (1931), pp. 67–70; abs. in Minnesota Sta. Rpt. 1931, p. 38*).—The author points out the frequent inadequacy of the A, B, C system of soil horizon nomenclature, and describes briefly the attempts of Vilensky and of Polynov to improve the system.

The use of the moisture equivalent in the textural classification of soils, G. B. Bodman and A. J. Mahmud (*Soil Sci., 33 (1932), No. 5, pp. 363–374, figs. 3*).—The results of moisture equivalent determinations of mixtures of soil samples of known moisture equivalent values and in known proportions are presented by the authors of this contribution from the California Experiment Station in support of the suggestion that a single diagram (tri-dimensional) based upon the Davis and Bennett soil class triangle (E. S. R., 57, p. 613), Smith's directly determined moisture equivalent values of soil separates (E. S. R., 39, p. 214), and the total sand content, may be used to give useful approximations to the textural class names.

"The texture of the sample would thus be fixed by means of moisture equivalent and total sand determinations only, both being operations which can be performed rapidly. In addition, the highly useful moisture equivalent value would be available for various other purposes. Since the diagram of Davis and Bennett is in turn based upon the mechanical composition of the soil as analyzed by a mild form of pretreatment and centrifugal separation (the Bureau of Soils old method of analysis), it is evident that this method of analysis alone can be used for an accurate designation of the class names of normal soils where this particular triangular diagram is to be used."

A new method of determining clay content of soils by moisture absorption at 70 per cent humidity, A. N. Puri (*Soil Sci., 33 (1932), No. 6, pp. 405–411, fig. 1*).—The author found it possible so to divide the vapor pressure curve of soils into three portions that these portions represent three forms of hygroscopic moisture. The first, that of hydration, depends on the constitutional nature of the soil colloids; the second, moisture absorbed by capillarity, on the surface area of the soil colloids; and the third on their state of aggregation. Though admitting that sharp delimitations of these three forms of moisture could not be made, he considers that "there is evidence to show that we shall not be far wrong in considering 10 per cent humidity as marking the end of the first form, and 70 per cent humidity as the end of second form." Clay (0.001 mm) content of a soil could be estimated from moisture absorption between 10 to 70 per cent humidity with a fair amount of accuracy, by the help of an empirical formula.

The fractionation, composition, and hypothetical constitution of certain colloids derived from the great soil groups, I. C. Brown and H. G. Byers (*U. S. Dept. Agr., Tech. Bul. 319 (1932), pp. 44*).—Eight soil samples derived from 7 different profiles were fractionated and analyzed, each as 5 fractions. The fractions were the silt (5μ to 50μ), clay (1μ to 5μ), and the three colloidal sizes, finer than 0.1μ, 0.1μ to 0.3μ, and 0.3μ to 1μ. The dispersion of the colloids was effected by treatment with water and, in some instances, with ammonium hydroxide at a maximum pH of 8.7. The silt and clay fractions of three of the samples were further dispersed with sodium hydroxide solution at a maximum pH of 11.

The samples included a chernozem, a prairie soil, a podsol, and three lateritic soils. The fractions of the colloids of the chernozem and of the prairie soils showed marked similarity in composition and properties within the range of colloidal size, "indicating the presence of a definite and predominating type of colloidal acid." Fractions of the podsol colloid were characterized by marked variation in chemical composition, "indicating the existence of a natural fractionation process which is in operation in the soils of this group." The podsol colloid appeared to be a mixture of (at least) iron oxide and the acidoid complex characteristic of the chernozem soils.

The fractions of the lateritic colloids showed differences in composition which were definite but not so marked as were those observed in the podsols. The existence in the lateritic soils of a colloid complex different from that found in the chernozem, prairie, and podsol colloids seemed probable.

According to "a theoretical outline of the origin and nature of soil colloids which the writers believe to be in harmony with the facts presented," the soil colloids represent progressive stages of degradation of complex silicates through hydrolysis, in which are to be distinguished the montmorillonitic acid and halloysitic acid stages and the final or lateritic stage. "The two hypothetical acids are both amphoteric. The colloids themselves consist of the partly neutralized salts of these acids and contain both acidic and basic radicals, together with organic colloid. The lateritic colloids possess only very limited base-holding capacity. Since the process of soil formation is continuous, no single colloid can be expected to contain one colloid component only, but in each colloid one component may be expected to dominate. The behavior of the soil will be in general harmony with the chemical properties of its dominant colloid, modified by the presence of other components so far as they occur."

The movement of gases through the soil as a criterion of soil structure, T. F. Buehrer (*Arizona Sta. Tech. Bul. 39 (1932), pp.* [2]+57, *figs. 12*).—The bulletin presents a critical study of soil structure, based upon the flow of air under various conditions through soil and other granular columns, in an apparatus in which the essential physical conditions could be accurately controlled; and shows the derivation of an equation based on the assumption that Stokes's law applies to a stationary granular system through which the fluid is passing. This equation combines the pressure drop through the column, depth of column, cross section of column, mean effective diameter of particle, and the viscosity of the gas.

The functional relationships between the volume-of-flow rate and the variables mentioned were separately determined. Correction required to be made for the "wall effect," resulting from a difference between the radius of the particle and that of the container. It was found that "such deviations from stream-line flow could be accounted for by way of a factor which is a linear function of the ratio of diameter of particle to that of the circular container." The volume-of-flow rate was found to vary directly as the pressure drop through the column, inversely as the depth of column, directly as the square of the diameter of particle, directly as the cross section of column, and inversely as the viscosity of the air. The air viscosity could be derived from the temperature and humidity of the air stream.

A value calculable from the flow equation on the basis of the experimental data for the various experimental materials was found to be constant over a wide range of physical conditions of measurement. The constant was "nondimensional, which shows that it is a function of structural soil characteristics only. This constant is designated as a 'structure constant' and is characteristic for typical granular materials." The structure constant varied from soil

to soil, the so-called "tight" soils giving a low constant, and the more permeable soils decidedly greater values. A comparison between the structure constant and the porosity of various soils indicated that the relation is not simply linear, as might be expected if all pores were continuous, and therefore available for gas flow. Preliminary experiments on the relation between textural composition and structure on mixtures of coarse sand and silt and mixtures of coarse sand and very fine sand, respectively, indicated that the structure constant decreases very markedly with successive additions in percentage of the finer constituent until about 30 per cent is reached, when it decreases gradually to zero.

The author describes a simplified apparatus "which makes possible a rapid determination of the structure constant for any given material, and is suitable for routine use."

Investigations concerning separation of similarly charged ions from soils by electrodialysis, A. Löddesöl (*Soil Sci., 33 (1932), No. 5, pp. 375–395, pl. 1*).—The author contributes from the Ohio State University the design of a 5-compartment modification of his all-glass electrodialysis cell (E. S. R., 67, p. 13), together with the results of further experiments indicating the possibility of a separation of certain ions by the use of membranes of different permeability between the chambers placed on the same side of the central compartment. The experimental results indicated also that a separation of certain cations from other cations can apparently be made by chemical means, since a precipitation could be arranged in an intermediate chamber, other cations being allowed to migrate to the end chamber.

A separation of pure "humic acids," dependent upon their inability to pass through rubber membranes slowly permeable by simpler anions, is further suggested.

Finally, "it was found that iron, aluminum, and magnesium under certain conditions migrated to the anode, presumably in the form of complexes consisting of hydroxides which had absorbed acid anions."

Physical and chemical characteristics of the soils from the erosion experiment stations, H. E. Middleton, C. S. Slater, and H. G. Byers (*U. S. Dept. Agr., Tech. Bul. 316 (1932), pp. 51*).—Mechanical analyses and gross chemical analyses of representative profile samples of each of the soil types on which eight erosion experiment stations have been established were made, together with detailed chemical analyses of the colloids of each soil type; determinations of the physical characteristics affecting erosional behavior and a study of their relation to each other, to the chemical composition of the colloid, and to field erosional behavior, so far as the latter is known at the present time; and determinations of the physical characteristics of composite samples from each tank plat at six of the stations.

"An analytical basis has been established, to which may be referred the future field behavior of these soils when it has been determined, so that a quantitative expression of anticipated behavior may be developed."

The need for accurate quantitative expression of the effect of soil structure on erosional behavior is pointed out.

[Soil Survey Reports, 1929 Series] (*U. S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpts.], Ser. 1929, Nos. 5, pp. 30, pls. 4, figs. 6, map 1; 6, pp. 34, pl. 1, fig. 1, map 1*).—The two surveys of which the reports are here noted were made with the cooperation, respectively, of the Colorado Experiment Station and the Georgia State College of Agriculture.

No. 5. *Soil survey of the Greeley area, Colorado,* A. T. Sweet et al.—The Greeley area, occupying 513,920 acres in Weld County in the northern part of Colorado, presents the surface features of an eastward and southeastward slop-

ing plain extending from the foot of the Rocky Mountains to the Missouri River. About three-fourths of the area surveyed is under irrigation, and extensive tracts are dry farmed.

The soils of the area are mapped and described as 10 series inclusive of 20 types. Of these, Terry fine sandy loam, covering 17.6 per cent of the total land surface, is the most extensive, and is followed by Weld fine sandy loam, which occupies 14.9 per cent.

No. 6. *Soil survey of McIntosh County, Georgia,* G. L. Fuller et al.—McIntosh County, southeastern Georgia, consists of 277,120 acres of low flatwoods. Tidal marsh, amounting to 28.1 per cent, and 13 per cent of swamp constitute the largest areas mapped in the county. Bladen fine sandy loam, 11.9 per cent, is the largest area listed among the 12 series of 20 types of classified soils.

Morphological, greenhouse, and chemical studies of the Black Belt soils of Alabama, G. D. Scarseth (*Alabama Sta. Bul. 237 (1932), pp. 48, figs. 24*).—The Black Belt soils, Sumter, Houston, Oktibbeha, Eutaw, Lufkin, Bell, Leaf, and Catalpa clays, are reported upon with respect to chemical and physical characteristics and fertilizer responses. Exchangeable cations and anions, percentage base saturation, titration curves, and buffer actions were determined on all the soils used. A 5-months' phosphate fixation experiment showed that at the end of this period less than 1 per cent of water-soluble PO_4 was recovered from soils that had received 4,000 lbs. of superphosphate per acre. Potassium was fixed to a much less extent. The calcium carbonate requirement of the acid soils showed that some of the soils require up to 16,000 lbs. of lime per acre to bring their reaction to pH 6.5. The calcium carbonate content of the Sumter clays was found frequently to vary from 5 to 50 per cent. Some soil properties, as degree of weathering, base exchange capacity, buffer values, color, plasticity, and fixation of phosphorus, are discussed in their relationship to the SiO_2-sesquioxide ratio of the colloid.

A quantitative study of the microorganic population of a hemlock and a deciduous forest soil, M. J. Cobb (*Soil Sci., 33 (1932), No. 5, pp. 325–345*).—The soils studied were of a very fine sandy loam type, collected in forest areas of the grounds of the New York Botanical Garden, and were found closely similar to, if not identical with, the Gloucester loam of the same vicinity. The numbers of bacteria, fungi, and actinomycetes were determined under a variety of moisture and temperature conditions.

The numbers of bacteria found in the topsoil under deciduous cover were about twice those found in the topsoil under hemlock or in the subsoil of the deciduous area; and bacteria were nearly six times as numerous in the deciduous topsoil as in the hemlock subsoil. Of actinomycetes, the deciduous topsoil contained twice as many as did the deciduous subsoil or the hemlock topsoil; and nearly three times as many as were found in the hemlock subsoil. Of fungi, twice as many appeared in the examination of the hemlock topsoil as in that of the deciduous topsoil; seven times as many as in the deciduous subsoil; and ten times as many as in the hemlock subsoil.

"These figures show that in the peaty hemlock topsoil the molds are responsible for most of the decomposition; whereas in the deciduous topsoil the bacteria are the main agents in the soil digestion processes and the fungi are in second place according to numbers. . . . Most of the work of decomposition is completed in the two topsoils, but in the subsoils that which is left to be done is carried on mainly by the bacteria. The actinomycetes and fungi aid in the process but are not the main agents."

In general, the greatest numbers of bacteria, fungi, and actinomycetes corresponded to the time of greatest soil moisture. The freezing of the soil caused a marked increase in the numbers of organisms, but this increase was not so

apparent in the case of the fungi. The counts in frozen soil were high but not the highest of the year. The seasonal maxima for the three types of organisms came in all soils in April, at the beginning of the growing season. The air temperature appeared to have no definite relation to the total numbers of bacteria, fungi, or actinomycetes.

The slight variations in the H-ion concentration had no apparent effect on the total numbers of bacteria, fungi, or actinomycetes.

In general, there was observed some parallelism between the numbers of bacteria and actinomycetes in each soil; but this was not so marked in the case of the fungi.

The microbiological population of peat, S. A. Waksman and E. R. Purvis (*Soil Sci., 34 (1932), No. 2, pp. 95–113, pls. 2*).—The authors of this contribution from the New Jersey Experiment Stations report a study of the nature and relative abundance of the bacteria of several layers of lowmoor, sedimentary, and highmoor peats.

In contradistinction to the belief said to be held by some investigators "that peat bogs are sterile below the surface," the present authors report that "an abundant population consisting of bacteria and, in the case of certain lowmoor peats, of actinomyces was found at all depths of the peat profiles." It is noted, also, that "the bacteria found in the lower depths of the highmoor peat profiles are autochthonous, or native to their medium, and have not been brought there by an outside agency. They find in the anaerobic system of those peats as natural a substrate as the aerobic bacteria find in soil or elsewhere, where free oxygen is admitted."

In highmoor peats the sphagnum layers showed a relatively limited bacterial population; but in the forest, sedge, or sedimentary layers bacteria were found in much larger numbers. Bacteria were found in the largest numbers in the layers showing the most decomposition. It is considered that microorganisms, largely bacteria, are chiefly responsible for the formation and transformation of peats.

Presence of Azotobacter and absence of Thiobacillus thiooxidans in peat soils, C. E. Skinner and I. J. Nygard (*Ecology, 11 (1930), No. 3, pp. 558–561; abs. in Minnesota Sta. Rpt. 1931, p. 18*).—The authors examined 55 peat soils for the presence of Azotobacter species. Peat soils, like mineral soils, supported Azotobacter only when at a pH of about 5.9 or above, although some of the soils were found anomalous as regards the tolerance of acidity by the so-called "calciphilic" crop plants. *A. chroococcum* was found in the more basic soils, and *A. beijerinckii* in the soils near the critical reaction (pH 5.9). A soil previously fertilized with flowers of sulfur was the only one found to contain *T. thiooxidans*.

Heavy plains soil nitrate problems, H. H. Finnell ([*Oklahoma*] *Panhandle Sta., Panhandle Bul. 41 (1932), pp. 8*).—This is a brief discussion of data more fully considered in Bulletin 203 of the Oklahoma Experiment Station (E. S. R., 67, p. 368). The topics here taken up are the soil nitrogen supply, factors which control the formation of nitrates and their removal from the soil, how to estimate fertility condition from simple crop history, and the conservation of nitrogen under semiarid conditions.

Preliminary report on the effect of certain chemicals on rice production and their effect on the rice soil, L. C. Kapp (*Arkansas Sta. Bul. 277 (1932), pp. 35*).—A variety of field and laboratory experiments on the soil needs of rice led the author to the tentative conclusion that "organic iron may partially solve the rice fertilization problem." A synthetic humic acid iron compound was prepared, which "is soluble in alkaline solutions and precipitates in acid

solutions. When [this was] added to nutrient solutions, the rice grew as well as in acid solutions containing inorganic iron."

The appearance of chlorosis and the failure of rice to attain normal growth were found not to be attributable, apparently, to lack of available nitrogen. Quantities of soluble manganese in excess of those capable of being rendered innocuous, as shown by McCool (E. S. R., 30, p. 128), by the quantities of other nutrients present, appeared to be responsible, in part at least, for the poor growth in the Clarksville soil of these experiments. Complete drying of the soil, in the greenhouse tests as well as in those made in the field, was followed by improved growth. It is stated in this connection that "the non-cropped soil solution as well as the solution from the cropped soil that has been completely dried contains larger amounts of iron than the continuously cropped soil."

In the field ammonium sulfate was apparently a little more effective than was sodium nitrate. In the greenhouse "heavy applications of potash" increased the yield; but in the field 1,024 lbs. of muriate of potash and 1,000 lbs. of acid phosphate failed to give an increase in grain yields.

Crop yields from Illinois soil experiment fields in 1931, F. C. Bauer (*Illinois Sta. Bul. 382 (1932), pp. 225–278, figs. 3*).—The bulletin extends, to cover the 1931 results, the record of the long-period experiment field work last noted in Bulletin 370 (E. S. R., 65, p. 323). The present addition to the report presents, in part 1, a summary of results for soil treatments for rotation periods ending in 1931, and in part 2 a tabulation of the crop yields for 1931, including "an acre-yield average of all crop-yield data on each field for each treatment presented in terms of pounds per acre."

Marl: Its formation, excavation, and use, S. G. Bergquist, H. H. Musselman, and C. E. Millar (*Michigan Sta. Spec. Bul. 224 (1932), pp. 34, figs. 18*).—This bulletin discusses the formation of marl, excavating and handling marl, and utilization of marl for agricultural purposes.

Experiments with commercial nitrogenous fertilizers, J. W. Tidmore and J. T. Williamson (*Alabama Sta. Bul. 238 (1932), pp. 60, figs. 9*).—In studies as to the relative value of nitrogen sources on 8 soil types, sodium nitrate produced more cotton for a 5-year period on 5 of these types than other sources, while on the remaining 3 types ammonium sulfate was about as effective. The average relative efficiency on the 8 soil series was sodium nitrate 100, ammonium sulfate 89, urea 86, a combination of Ammophos A and sodium nitrate 82, Leunasalpeter 82, and cottonseed meal 57.

The continued use of acid-forming nitrogenous fertilizers on unlimed land caused a reduced crop yield due to the development of soil acidity and a reduction in the amount of soil bases. In sandy soils the acidic fertilizers decreased the amount of exchangeable calcium and increased the amount of exchangeable hydrogen to an extent which was injurious to plant growth. The extent to which acid-forming fertilizers increased soil acidity varied with the soil and the chemical composition of the fertilizer; but relative values are given as ammonium sulfate 100, ammonium phosphate 100, Leunasalpeter 75, urea 50, and ammonium nitrate 50. Acidic nitrogenous fertilizers, when used on the same soil for a considerable period of years, caused a marked decrease in phosphate availability and an increase in water-soluble potassium.

Physiologically basic fertilizers caused an increase in phosphate availability and a reduction in the water-soluble potassium. Sodium nitrate was leached from a sandy and from a clay soil to a much greater extent than was ammonium sulfate. "Ammonium nitrogen was absorbed by cotton seedlings more rapidly than nitrate nitrogen."

Under field conditions, the physical properties of the sandy loam soils were not affected to an appreciable extent by any of the sources of nitrogen. An increased soil acidity was found to be preventable by the use of a combination in which about 70 per cent of the nitrogen is in the form of sodium or calcium nitrate and about 30 per cent in the form of ammonium sulfate or ammonium phosphate. Other combinations could be calculated from the data presented. Soil acidity developed by acid-forming nitrogenous fertilizers could be corrected by sufficient applications of basic slag, or of limestone or dolomite mixed with the fertilizers or applied to the soil in the drill or broadcast.

Effect of fertilizers on the chlorine content of the sap of corn plants, N. A. PETTINGER (*Jour. Agr. Research [U. S.], 44 (1932), No. 12, pp. 919–931, figs. 2*).—The use of fertilizers containing chlorine increased the chlorine content of the sap of corn plants at the Virginia Experiment Station, the increase being partially proportional to the amount of chlorine supplied by the fertilizer. Chlorine added in potassium chloride approximately 15 years ago is stated still to be exerting a residual effect on the chlorine content of the plant sap. A tendency of this residual effect to be inversely proportional to crop yields was noted, but the chlorine supplied by manure 15 years ago was not shown to be exerting a residual effect at present. The sap of corn plants was found to contain approximately one-fourth as much chlorine as potash. Potassium chloride increased the chlorine: potash ratio slightly, while manure lowered it slightly. As the chlorine content of the sap increased, the H-ion concentration increased also.

Fertilizers containing sulfur failed to cause an appreciable accumulation of sulfate ions in the sap of corn plants. Corn plants absorbed the chloride ion much more readily than the sulfate ion. Previous work on the components of corn sap has been noted (E. S. R., 66, p. 19).

Fertilizer developments (*U. S. Dept. Agr. Yearbook 1932, pp. 529–548, figs. 6*).—The brief papers assembled under this head are as follows: Fertilizer Industry Making Adjustments to Complex Economic Requirements, by R. O. E. Davis (pp. 529–533); Fertilizer Sources Ample for Midwest, Cost Cut by Higher Concentration, by J. W. Turrentine (pp. 533–535); Fertilizer Combining Superphosphate with Free Ammonia Succeeds, by W. H. Ross and K. D. Jacob (pp. 535–537); Potash Extraction from United States Deposits Studied in Promising Experiments, by P. H. Royster (pp. 537, 538); Fertilizer Placement of Vast Importance in Cotton-Growing States, by J. J. Skinner (pp. 538–541); Fertilizer Experiments Show Phosphate is Chief Need in the Middle West, by O. Schreiner (pp. 542–545); and Tobacco in Some Soils May Require Secondary Elements in Fertilizer, by J. E. McMurtrey, Jr. (pp. 545–548).

Analyses of commercial fertilizers, season 1931–1932, R. N. BRACKETT (*South Carolina Sta. Bul. 284 (1932), pp. 51*).—The bulletin consists essentially of the usual analytical data.

AGRICULTURAL BOTANY

Movement of organic materials in plants, A. S. CRAFTS (*Plant Physiol., 6 (1931), No. 1, pp. 1–41, pls. 4, figs. 3*).—In place of the three main theories existent as regards the movement of organic materials in plants, namely, that it is due to a hydrostatic pressure gradient, that it is due mainly to diffusion through the phloem, or that it is due to mass flow through the sieve tubes, the author suggests the existence of the osmotic system such as has been advocated by Pfeffer, Blackman, and Münch, with the total phloem for a roadway. This would furnish during functionality in the walls of the potato stolon about 37 per cent of the total cross sectional area, in pumpkin about 30 per cent. Relevant facts and experimental data are presented with discussion.

Tracing the transpiration stream with dyes, R. B. Harvey (*Amer. Jour. Bot., 17 (1930), No. 7, pp. 657–661, figs. 3; abs. in Minnesota Sta. Rpt. 1931, p. 30*).—The author demonstrated the path of the transpiration stream in stems and into fruits and seeds by means of nontoxic dyes. A direct connection between dodder and a host plant was proved by the passage of dye from the xylem of the host to the xylem of the dodder.

Effects of insolation and soil characteristics on tissue fluid reaction in wheat, W. F. Loehwing (*Plant Physiol., 5 (1930), No. 3, pp. 293–305, fig. 1*).—"Tissue fluids from entire wheat tops showed diurnal acid periodicity, free acidity reaching a minimum in the evening and a maximum in the early morning. Sap acidity of wheat plants on acid soils was much greater than that of plants on the same soils after applications of calcium carbonate to correct acidity. The general level of free acidity was much lower in plants on an untreated, low mineral humus than in those on an acid loam higher in mineral matter. Symptoms of acid toxicity appeared in the tops of 8-weeks-old wheat on the untreated acid humus. Following correction of soil acidity with lime, the sap hydrion concentration of plants on the humus was reduced more than in those on the loam. The sap acidity of strongly insolated plants on limed humus soil fell below the level necessary for iron mobility, as shown by chlorosis and absence of iron in the leaves. When chlorosis had persisted for two or more weeks leaves gradually lost their turgor, and acidity rose rapidly as the moisture content diminished."

Titration curves of etiolated and of green wheat seedlings reproduced with buffer mixtures, A. M. Hurd-Karrer (*Plant Physiol., 5 (1930), No. 3, pp. 307–328, figs. 6*).—In the approximate reproduction of both alkali- and acid-titration curves of the juice of both etiolated and green wheat seedlings with chemical mixtures containing asparagine, phosphates, sodium malate, glucose, and, in green seedlings, leucine, asparagine appeared to be the substance in the juice of the etiolated seedlings which was responsible for the characteristic point of inflection of the titration curve near pH 8.9. Phosphates seem to be the principal buffers between pH 6.0 and 7.5. The equilibrium between the primary and secondary phosphates may be intimately associated with the maintenance of the normal reaction of the tissues. Over the range of the acid-titration of the juice (below pH 6.0), the buffering seems due largely to the presence of an organic acid constituent. Sodium malate alone, or a combination of tartrate and citrate with or without malate, gives acid-titration values similar to those of the juice. The zone of decreasing buffer capacity below pH 3.5 and pH 4.0, respectively, in the oxalate and succinate curves, giving rise to characteristic inflections which do not occur in the titration curves of wheat juice, is thought to preclude the presence of these salts in wheat juice in sufficient amount to affect the titration values. Glucose supplied the requisite buffer capacity of the etiolated seedling juice above pH 9.5. In the case of green seedlings, both leucine and glucose were used in reproducing the titration curve over this region because the requisite amount of glucose alone was so much greater than that found in the juice. The glucose was considered to be representative of all the soluble carbohydrates of the juice which react with alkali above pH 9.5.

The most pronounced changes in the buffer system of the wheat plant during the period of seedling development seem to be due to a reduction in asparagine content and an increase in an organic acid constituent as assimilation processes become established in the young plant.

The rôle of manganese in the nutrition of Lemna, N. A. Clark and C. L. Fly (*Plant Physiol., 5 (1930), No. 2, pp. 241–248, figs. 3*).—In a study seeking

to test views regarding the supposed essentiality in plant nutrition of manganese, no indications of such indispensability were found, nor was there any increase of reproduction rate corresponding to the increase of manganese. Above 1 part per million the solution shows gradually increasing toxicity, size, weight, ash, and reproduction figures proving very irregular. There is some indication that the plant can adapt itself to manganese.

The relation of temperature and the partial pressure of oxygen to respiration and growth in germinating wheat, W. B. MACK (*Plant Physiol., 5 (1930), No. 1, pp. 1–68, figs. 7*).—This paper represents the detailed and tabulated results of an experimental study on carbon dioxide production and shoot elongation in very young wheat seedlings subjected to 60 different maintained environmental complexes representing a wide range of temperatures and of partial pressures of oxygen in the culture solution, with an explanation of the environmental background practically common to the experiments. Conclusions are detailed with explanation.

A fundamental principle is that the relation of any process to any influential condition or influence can not be definitely stated without quantitative reference to the other prevailing influences.

Note on the relation of rate of respiration to chemical composition in fresh vegetables, M. P. BENOY and J. E. WEBSTER (*Plant Physiol., 5 (1930), No. 1, pp. 181, 182*).—"In a recent publication [from the Oklahoma Experiment Station (E. S. R., 61, p. 611)], the rates of respiration of some common vegetables during the first 30 hours after harvesting were compared. Samples of the same material were prepared for analysis by careful drying, and with the exception of the phosphorus fractions [E. S. R., 60, p. 204] standard analytical procedures were used. It was thought that, although these vegetables represented different organs, and might naturally be expected to respire at different rates, there might be certain relationships between the rate of respiration and the chemical composition which would transcend the lines of demarcation laid down by function. In an attempt to detect such relationships, suggested or even vaguely possible, the analytical data were plotted in a variety of ways together with the respiration figures. But we were unable to discover any relationships which ran consistently through the series.

"Soluble nitrogen seemed to be directly related to respiration in the case of asparagus, green beans, okra, green onions, and carrots; with the other vegetables, the curve for this relationship was very irregular. Ether extract and lipoid phosphorus showed a nearly constant value for all the vegetables, without relation to respiration. The reducing-sugar values, which might have been expected to run parallel with the respiration curve, were extremely variable, as were also the starch values which might have been expected to bear an inverse relationship to respiration."

Carbon dioxide dissolved in plant sap and its effect on respiration measurements, J. J. WILLAMAN and W. R. BROWN (*Plant Physiol., 5 (1930), No. 4, pp. 535–542, figs. 3; abs. in Minnesota Sta. Rpt. 1931, pp. 19, 20*).—A description is given of a method for measuring the dissolved carbon dioxide in the sap of apple twigs and other plant tissues. The authors report that when apple twigs were raised from a lower to a higher temperature the output of CO_2 at the higher temperature was temporarily increased above the level that it subsequently attained at that temperature. The effect was greater, the lower the previous temperature. The temperature flush was believed to be due to the lower solubility of the CO_2 at the higher temperature. When plant tissue, such as twigs, potato tubers, and wheat grain, was stored in a closed chamber and CO_2 was allowed to accumulate, after which it was removed and the rate of the

output of CO_2 measured, the rate was found to rise to a temporary high value. Later it subsided to a lower level characteristic of the temperature used. This is believed to be due to an actual increase in the rate of production of CO_2 occasioned by the higher acidity of the sap during the accumulation of CO_2. The peak of CO_2 output is believed to be due, at least partly, to the diffusion of previously formed CO_2 which was held in solution.

The varieties of apples that have the greatest winter hardiness showed the lowest output of CO_2, and they also contained the lowest amount of dissolved CO_2. The causal connection between these two factors is not known.

Attention is called to the necessity of a careful distinction between the production of CO_2 and its output in plant respiration studies.

Relation of increased water content and decreased aeration to root development in hydrophytes, J. E. Weaver and W. J. Himmel (*Plant Physiol., 5 (1930), No. 1, pp. 69–92, figs. 11*).—Details including similarities and contrasts are presented as to the outcome of growing plants of the great bulrush (*Scirpus validus*), cattail (*Typha latifolia*), reed (*Phragmites communis*), and tall marsh grass (*Spartina michauxiana*), under four sets of conditions of aeration and water content, that is, water-logged soil, soil alternately saturated and drained, moist soil, and dry soil.

A critical and historical study of the pectic substances of plants, M. H. Branfoot (M. H. Carré) ([*Gt. Brit.*] *Dept. Sci. and Indus. Research, Food Invest., Spec. Rpt. 33 (1929), pp. X+154, pl. 1, figs. 9*).—Besides a systematic and detailed treatment of fruit pectic substances, there is given an extended bibliography of the literature.

Relations between various physiological phenomena in plants and coloring materials appearing in vegetative organs.—I, Relation between anthocyanin formation and growth in Abutilon avicennae [trans. title], H. Kosaka (*Jour. Dept. Agr., Kyushu Imp. Univ., 2 (1929), No. 8, pp. 207–240, figs. 2*).—The degree of coloration in Abutilon plants bears an inverse relation to the degree of utilization, during growth, of building material, or a direct relation to the degree of storage of such material.

Comparative studies on the natural and acquired resistance of certain strains of Escherichia coli to the bacteriostatic and germicidal effects of cations, E. K. Borman (*Jour. Bact., 23 (1932), No. 4, pp. 315–329*).—The relative bacteriostatic and germicidal potencies of cations followed the same ascending series for each strain of the organism, according to this communication from the Kentucky Experiment Station, the germicidal potency of any cation occupying the same relative position in such a series as did the bacteriostatic potency. Acquired resistance to the bacteriostatic action of one cation induced a comparable increase in resistance to the bacteriostatic and germicidal action of other cations with different chemical properties. These observations are considered to suggest that "both the bacteriostatic and the germicidal effects of cations are produced by identical or intimately related properties, probably physicochemical in nature. Furthermore, they indicate that the defense mechanism invoked by the organism undergoing artificial stimulation of resistance to bacteriostatic and germicidal power is the same for all cations."

Toxicity of some aliphatic alcohols, W. S. Eisenmenger (*Plant Physiol., 5 (1930), No. 1, pp. 131–156, figs. 6*).—"Previous investigations have revealed the importance of certain ions for plant life, and the use of mixtures of salts in aqueous solution containing these ions has led to a conception of a favorable medium for complete plant development." In the present investigation the two criteria of growth employed were (1) elongation of roots of germinating soybeans, and (2) the ash of the shoot (stem and leaf).

A study was made of the influence exercised by various alcohols, and the principal results and conclusions are detailed at some length.

Experiments with Trianea on antagonism and absorption, J. R. Skeen (*Plant Physiol., 5 (1930), No. 1, pp. 105–118*).—In these experiments, undertaken to check by a different technic, observations previously reported (E. S. R., 60, p. 623) using seedlings of *Phaseolus* sp. and *Lupinus albus*, it is stated that the data here presented confirm the observations previously reported and afford evidence that calcium decreases the degree of permeability of cells to a marked extent.

In a single salt solution, iron readily penetrates the root hairs of *T. bogatensis*. Calcium, a relatively nonpenetrating ion, decreases the rate of entry of iron into the hairs. In the antagonism of calcium for iron, the external part of the plasma membrane only is affected. Some evidence is presented that the plasma membrane is physiologically different from cytoplasm. Such substances as sodium oxalate, tannin, and hematoxylin, when present, protect the cell from the lethal action of iron.

On the decomposition of agar-agar by an aerobic bacterium, S. A. Waksman and W. Bavendamm (*Jour. Bact., 22 (1931), No. 2, pp. 91–102*).—A bacterium capable of liquefying agar was isolated at the New Jersey Experiment Stations from marine sediments, and was found to occur in these sediments in large numbers.

The organism attacked rapidly the hemicellulose complex of the agar, using it as a source of energy. A large part of the carbon was liberated as carbon dioxide, but a part was utilized by the organism for the synthesis of cell substance. The bacterium was found to require a source of nitrogen for the decomposition of the agar and for the synthesis of its cell substance, the nitrogen of the agar not being readily utilized. Nitrate nitrogen was utilized much better than that of ammonium salts.

The bacterium could produce an enzyme capable of hydrolyzing mannan and starch to reducing sugars. "Under unfavorable conditions of growth, the organism allows the sugar to accumulate."

Energy emanation during cell division processes (M-rays), D. N. Borodin (*Plant Physiol., 5 (1930), No. 1, pp. 119–129, figs. 3*).—It is stated that experiments by the author with M-rays (mitogenetic rays) conducted by him since 1928 are partly a continuation of work done by a small group of Russian so-called "Practical Vitalists." A number of experiments are presented with discussion.

"The source of M-rays (mitogenetic rays) in a living cell has not been definitely located, but it has been found already that not all the tissues of plants and animals possess this peculiarity in equal measure. The possibilities of the location of this activity in the nuclei or chromosome substances [are] not to be excluded. If it should prove to be the case that the radiations arise from the nuclei or chromosomes, a new page in the history of the study of gene activities will be opened. At present, however, we only know that there is a definite connection between the intensity of the metabolic processes and the emanation of M-rays."

Preliminary results in measuring the hardiness of plants, S. T. Dexter, W. E. Tottingham, and L. F. Graber (*Plant Physiol., 5 (1930), No. 2, pp. 215–223, figs. 2*).—Experiments and data as outlined show that the degree of cold resistance in plants may be estimated by the diffusion of electrolytes and other substances from chilled or frozen tissues after thawing. The amount of diffusion has been determined in the case of alfalfa roots by conductivity measurements, supplemented by colorimetric tests for chlorides. Correlations were

found between known hardiness of alfalfa roots and the degree of retention of electrolytes after freezing.

The 50-year period for Dr. Beal's seed viability experiment, H. T. DARLINGTON (*Amer. Jour. Bot., 18 (1931), No. 4, pp. 262–265, fig. 1*).—The seed viability experiment initiated by Beal completed its fiftieth year in 1929, and the appropriate tests were made in the spring of 1930. Previous reports on this experiment have been noted (E. S. R., 38, p. 224), and an additional account was given by the author in 1922.[4]

The results are summarized in tabular form for the 50-year period, this account giving the number of individuals germinated in each species and the percentage of germination. A tabular record is also given of those seeds which germinated at one time or other throughout the 50-year period. The 11 sets still remaining buried are now planned to be dug up at intervals of 10 years, thus extending the experiment for 110 years, or to 2039.

GENETICS

Nucleolar behaviour in the mitosis of plant cells, P. E. FREW and R. H. BOWEN (*Quart. Jour. Micros. Sci. [London], n. ser., 73 (1929), No. 290, pp. 197–214, pl. 1*).—This paper deals chiefly with matters related to the factors involved in the poleward movement of the chromosomes.

Resting nuclei of *Cucurbita pepo* and *C. maxima* contain a single, relatively large nucleolus, part, at least, of which is said to persist during nearly the entire process of mitosis. Its behavior is outlined, as it is believed that a similar process of nucleolar division probably occurs in plant cells throughout a wide variety.

The bearing of this type of nucleolar division on theories of the dynamics of anaphase migration of the chromosomes is briefly discussed.

Mechanical separation of gametes in maize, P. C. MANGELSDORF (*Jour. Heredity, 23 (1932), No. 8, pp. 288–295, figs. 3*).—A more elaborate discussion of the study already noted (E. S. R., 67, p. 225).

The A series of allelomorphs in relation to pigmentation in maize, R. A. EMERSON and E. G. ANDERSON (*Genetics, 17 (1932), No. 5, pp. 503–509*).—A^b, one of the two new allelomorphs of the *A* factor for aleurone, plant, and pericarp color, described from studies at Cornell University, resembled normal *A* in its effect on the anthocyanin pigmentation of the plant, but it converted the red pericarp pigment into a corresponding brown pigment. It was dominant to *A* in this respect. The allelomorph a^p resembled A^b in its dominant effect on pericarp color, but it gave pale aleurone color with *C* and *R*, and it was almost the recessive *a* in its effect on plant color. The interactions of the several allelomorphs of *A* with various other aleurone genes (*C*, *R*, *B*, *Pl*, *P*, and *sm*) are summarized.

Some factors affecting the reversal of sex expression in the tassels of maize, F. D. RICHEY and G. F. SPRAGUE (*Amer. Nat., 66 (1932), No. 706, pp. 433–443*).—The reversal of sex expression in corn, i. e., development of silks in tassels, was found to be influenced by both environment and heredity. When several self-fertilized strains of corn were grown under controlled conditions in the greenhouse, shorter daily light periods and lower temperatures tended to bring about the development of silks in the tassels, while the opposite conditions tended toward normal sex expression. When a low additional intensity of light was supplied during daylight, little if any effect upon sex reversal was noted. Different inbred strains were observed to differ markedly in the de-

[4] Amer. Jour. Bot., 9 (1922), No. 5, pp. 266–269.

gree to which they were affected by changes in environment. F_2 and back-cross progenies from a cross between two strains differing in tendency toward reversal of sex expression segregated typically for a difference in a single major factor pair, the recessive determining the greater tendency to reversal. Additional, less important genes also appeared to be involved.

Methods of testing inbred lines of maize in crossbred combinations, M. T. Jenkins and A. M. Brunson (*Jour. Amer. Soc. Agron., 24 (1932), No. 7, pp. 523–530*).—Comparison of coefficients of correlation for different characters determined between the mean performance of the single crosses of inbred lines of corn and their performance in crosses with a commercial variety or with a varietal mixture, and also determined between the mean performance of crosses of several inbred lines, led to the conclusion that crosses with open-pollinated varieties may be used efficiently in the preliminary testing of new lines.

Phalaris arundinacea, Ph. tuberosa, their F_1 hybrids and hybrid derivatives, T. J. Jenkin and B. L. Sethi (*Jour. Genetics, 26 (1932), No. 1, pp. 1–36, pls. 2, figs. 22*).—When *P. arundinacea* was the female parent in crosses with *P. tuberosa* in studies by Jenkin at the Welsh Plant Breeding Station, stimulation of ovaries by pollination was very general compared with the reciprocal, and a much higher yield of germinable seed was produced. The F_1 hybrids were vigorous, differed from the parents in many characters, and were functionally male-sterile although probably producing a very low proportion of good pollen. Some were rather highly female-fertile in the presence of the parental species. Back crossing to the parents gave very poor results, and so far it was only proved that the back crossing to *P. tuberosa* could give seedlings, although signs of stimulation by *P. arundinacea* pollen were evident. F_2 plants obtained by open pollination varied widely in type and some differed markedly from the parents and the F_1. The characteristics of F_3 and F_4 also are described.

Cytological studies by Sethi showed 28 chromosomes as the somatic complement, 14 bivalents in the heterotypic metaphase, and very similar meiotic behavior of the chromosomes in the 2 species, only 1 or 2 bivalents exhibiting slight lagging. While the somatic number in the F_1 was also 28, in the heterotypic metaphase of the pollen mother cells 12 bivalents and 4 univalents were constantly found. Subsequent development in the F_1 pollen mother cells usually resulted in the production of supernumerary nuclei, but some normal pollen apparently was produced. Pairing of chromosomes in the Phalaris hybrid seemed to be of a much higher order than in 14+14 Aegilops-Triticum hybrids and Aegilops-Aegilops hybrids, but apparently somewhat lower than in 14+14 chromosome Triticum-Triticum.

Certain phases of the breeding work are discussed by Jenkin in the light of the cytological observations by Sethi.

Sugarcane-sorghum hybrids.—Part I, General outline and early characters, T. S. Venkatraman and R. Thomas (*Indian Jour. Agr. Sci., 2 (1932), No. 1, pp. 19–27, pls. 7*).—The origin, technic, propagation, appearance, and early characters of the cross between P. O. J. 2725 sugarcane and Periamanjal sorghum (E. S. R., 63, p. 827) are described in some detail.

Cytological studies of some hybrids of Aegilops sp. × wheats, and of some hybrids between different species of Aegilops, J. Percival (*Jour. Genetics, 22 (1930), No. 2, pp. 201–278, figs. 297*).—A detailed account of the cytological behavior of 33 hybrids of *A. ovata, A. cylindrica, A. triuncialis,* and *A. ventricosa* crossed with diploid, tetraploid, and hexaploid wheats, as well as hybrids among the 4 species of Aegilops.

Cytological studies of some wheat and Aegilops hybrids, J. Percival (*Ann. Bot. [London], 46 (1932), No. 183, pp. 479–501, figs. 77*).—Meiosis was studied in the pollen mother cells of 11 hybrids between species of wheat and Aegilops of different degrees of taxonomic relationship.

The chromosomes of the heterotype metaphase always opened out from a dense synizetic knot formed immediately after a stage in which all the chromosomes are clearly defined. At the heterotype metaphase varying numbers of univalents and bivalents were observed. The bivalents were of the typical acrosyndetic form in which the two component chromosomes are joined end to end in a straight line and the parasyndetic type in which the chromosomes are united in the form of a ring or broken link. Chromosomes uniting in the latter manner are considered to be exactly homologous, while those joined end to end, as in the acrosyndetic bivalents, are more remotely related. The behavior in other phases is also described.

The results of these investigations suggested that where all the bivalents are of the parasyndetic or ring type, the parents of such a cross belong to the same species. Where only acrosyndetic bivalents are found, the parents of the hybrids are more remotely related, being usually more marked varieties or subspecies; and where only univalents are observed at metaphase, the parents of the hybrids are still more widely separated, belonging to different species.

Inheritance of lint colors in upland cotton, J. O. Ware (*Jour. Amer. Soc. Agron., 24 (1932), No. 7, pp. 550–562*).—Crosses between strains of upland cotton, including I, Texas Rust (rust-colored lint) × Hite (white lint); II, Algerian Brown (dingy brown) × Sproull (white); III, Nankeen (yellowish brown) × Rowden (white); and IV, Argentine Green (green) × Trice (white), were studied in several filial generations at the Arkansas Experiment Station.

Lint color in the F_1 of each cross was an intergrade between that of the respective colored and white parents, each of the four shades of the lint color being incompletely dominant over white. In F_2 the respective crosses segregated into the colored parental type, an intergrade colored type identical with the F_1, and the white parental type. The parental types continued to breed true in subsequent generations, while the intergrade type split up as did the F_1. It was evident that in upland cotton each of the lint colors rust, dingy brown, yellowish brown, and green is a distinct monohybrid character. Fine silky texture of lint as found in cross IV seemed to be completely linked with full green lint color, and coarse lint appeared to be dominant over fine lint.

The inheritance of Fusarium wilt resistance in flax, C. R. Burnham (*Jour. Amer. Soc. Agron., 24 (1932), No. 9, pp. 734–748, figs. 2*).—Field wilt tests at the Wisconsin Experiment Station of selections from a collection of flax varieties showed certain strains to be completely susceptible, others highly resistant, and others to breed true for intermediate degrees of susceptibility. The wilting in pure resistant strains evidently was not due to segregation. In the one resistant strain (No. 15) tested by plating, the organism could be isolated from stem tissue of plants which apparently were completely healthy. In the F_3 from the cross of a resistant and a susceptible strain only a small percentage of the families were as resistant as the resistant parent. Most of the families fell into the highly susceptible classes, and only a few showed intermediate degrees of resistance. A slight indication of linkage between susceptibility and one of two duplicate factors for yellow seed coat color was obtained. The fact that crosses between certain resistant strains of different origin showed a high percentage of wilt indicated that they may carry different factors for resistance. Natural crossing of 1.12 per cent was observed, although the percentage varied from 0 to 4.29 on different plants.

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Inheritance of characters in Setaria italica (Beauv).—Part II, Anther colours, G. N. R. AYYANGAR and T. R. NARAYANAN (*Indian Jour. Agr. Sci., 2 (1932), No. 1, pp. 59–61*).—The two fresh-anther colors met with in *S. italica*, i. e., brownish-orange and white, while dry and when seen in bulk appear brownish-black and buff-yellow, respectively. They were found to form a simple Mendelian pair with orange dominant. The first part of this series (E. S. R., 67, p. 25) dealt with grain colors.

A new pod color in snap beans, T. M. CURRENCE (*Jour. Heredity, 22 (1931), No. 1, pp. 21–23, fig. 1; abs. in Minnesota Sta. Rpt. 1931, p. 19*).—The occurrence is noted of pods of distinctly white color in the F_2 generation of crosses between Crystal White wax and yellow podded varieties. Six progenies grown from white podded F_2 plants yielded 136 F_3 individuals, all of which bore white pods, with no further segregation for pod color in the fourth and fifth generations.

The oestrous cycle of the ewe; histology of the genital tract, L. E. CASIDA and F. F. MCKENZIE (*Missouri Sta. Research Bul. 170 (1932), pp. 28, figs. 10*).—A histological study is reported of the mucosa of the vagina, uterus, and Fallopian tubes of nine ewes slaughtered from 1 hour to 14 days following the beginning of the last oestrous period before death. The ewes were considered in oestrum during the day following reception of the ram; in metoestrum at the 2-, 4-, and 5½-day stages, in dioestrum at the 7½-, 9-, and 11-day stages, and in prooestrum at the fourteenth day following reception of the ram.

Active proliferation of the uterine epithelium occurred during metoestrum. Leucocytes were never absent from the vaginal epithelium, and there was intensive invasion of leucocytes in the uterine epithelium during metoestrum and early dioestrum. Some cornified layers were present in the vaginal epithelium at all times.

During much of metoestrum the cells of the connective tissue stroma of the Fallopian tubes were swollen and vacuolated. Cytoplasmic projections extended from the epithelial cells of the tubes during dioestrum, which became taller during prooestrum and early oestrum. The fimbriated ends of the tubes showed a similar condition, but somewhat later in the cycle. The corpora lutea were largest in dioestrum, while the size of the follicles increased during late oestrum and metoestrum.

Secretory activity in the cervical glands observed during the greater part of dioestrum was especially marked in prooestrum.

FIELD CROPS

[Field crops experiments at the Raymond, Miss., Substation, 1931], H. F. WALLACE (*Mississippi Sta. Bul. 299 (1931), pp. 1–11, fig. 1*).—Experiments with field crops reviewed again (E. S. R., 65, p. 31) included variety tests with cotton, corn, grain sorghum, sorgo, soybeans, oats, rye, and wheat; fertilizer tests with corn and alfalfa; and interplanting tests with corn and legumes. Other cotton investigations comprised fertilizer trials comparing formulas, factory v. home mixed, and sources of nitrogen, phosphorus, and potassium; spacing tests; seed treatments for diseases; control of boll weevil and plant lice; and the response to different winter legumes.

Drying of legume hay plants: A study to determine the rôle of the leaves in drying the stems and the relation of method of drying to loss of leaves and chemical composition, F. L. HIGGINS (*Minnesota Sta. Tech. Bul. 83 (1932), pp. 42, figs. 12*).—Investigations of the drying process of legume hay crops carried on at the University Farm from 1924 to 1927, inclusive, are reported.

The wounds made by detaching the leaves from the stems were found to have no appreciable effect on the drying of the stems of alfalfa, red clover, and soybeans, but materially hastened the drying of the stems of sweetclover. The leaves of alfalfa and red clover did not function appreciably in withdrawing moisture from the stems during the drying period, whereas it appeared that sweetclover and soybean leaves aid in drying the stems by withdrawing the water from them. Stems and leaves dried more rapidly in the sun than in the shade.

Where the Dain method of drying alfalfa (based on the theory that the leaves of legume hay plants, if kept from drying too rapidly, aid in drying the stems by withdrawing the moisture from them during haymaking) was compared with several other methods, no advantage resulted from windrowing immediately after cutting. Alfalfa windrowed with a left-hand side-delivery rake just after mowing and turned every 4 hours dried at practically the same rate as alfalfa left in the swath throughout the drying period. Alfalfa dried in the swath for 2, 4, 6, and 8 hours preceding windrowing dried at practically the same rate as that dried in the swath or windrow throughout. When cocked as soon as cut, alfalfa dried very slowly and showed a tendency to mold. Where cocking was preceded by partial drying in the swath or windrow, the drying rate increased in proportion to the number of hours left in the swath or windrow. Alfalfa dried in the swath during clear hot weather to a moisture content approximating 25 per cent was badly bleached, and the leaves were so brittle that much was lost during handling. Alfalfa largely dried in the windrow or cock retained its green color, was soft and tough, and lost but little of the leaves during handling.

When subjected to shaking, alfalfa dried in the swath in the sun lost 25.3 per cent as compared with 20.7 per cent for that dried in the swath in the shade, 21.6 per cent in windrow and not turned, 22.3 per cent in windrow and turned, and 16.6 per cent for that dried largely in the cock. Alfalfa and red clover, dried to less than 8 per cent moisture in a well-ventilated oven at 180° F. in from 5 to 7 hours, had essentially the same composition as hay dried in the sun to moisture percentages of from 5.1 to 12.5 in from 32 to 55 hours, or in the shade to from 8.2 to 19.5 per cent in from 79 to 100 hours. The fact that the composition of the hay dried slowly in the shade approximated that of hay dried more rapidly in the sun and in the oven was held to indicate that under such conditions fermentation does not take place to any extent.

The operation of interspecific competition in causing delayed growth of grasses, H. G. Chippindale (*Ann. Appl. Biol., 19 (1932), No. 2, pp. 221–242, pls. 2*).—The causation by Italian ryegrass of delayed establishment in meadow fescue, timothy, and rough-stalked meadow grass was studied at the Welsh Plant Breeding Station. The presence of seeds or seedlings of the ryegrass was not detrimental to germination of the other grasses under conditions likely to occur in the field, except with the meadow grass whose seeds are extremely susceptible to the presence of carbon dioxide, and hence to root respiration; but under certain conditions seedlings of the ryegrass inhibit completely growth of seedlings of the other three grasses, the latter being deprived of light and soil nutrients. The seedlings suppressed in this way persist remarkably and can recover immediately upon removal of competition. The effect of different physical factors on germination in the four species is described. The action of low temperatures in depressing the germination of the other three grasses more than that of the ryegrass is considered an important factor in interspecific competition.

An ecological study of closely cut turf treated with ammonium and ferrous sulphates, G. E. Blackman (*Ann. Appl. Biol., 19 (1932), No. 2, pp.*

204–220, figs. 5).—Changes in botanical composition of closely cut turf, as of lawns, resulting from applications of ammonium sulfate at the rate of 3 lbs. per 1,000 sq. ft. (1.2 cwt. per acre) every two weeks during spring and summer and watered in, were observed at five centers in England during three years. The areas covered by the weeds—i. e., all species other than Gramineae—were diminished greatly by the treatments; and this reduction was associated with an increase in the area covered by the grasses, the dominant species showing the greatest expansion. Ferrous ammonium sulfate and an equivalent mixture of ferrous and ammonium sulfates both produced greater reductions than ammonium sulfate alone. The slight change in soil reaction showed that the view that soil acidity is a prerequisite for weed suppression by ammonium sulfate is untenable. It was suggested that the effect of ammonium sulfate is due to a differential action of the ammonium ions, toxic to most of the weeds while increasing the growth of the grasses.

The establishment of pasture on virgin peat, D. Clouston (*Scot. Jour. Agr., 15 (1932), No. 3, pp. 280–286*).—A scirpus peat area was converted into high-grade pasture in less than two years by drainage, liming, complete fertilizer, and the seeding of mixtures containing meadow grasses and wild white clover, and also timothy, dogtail, orchard grass, and alsike clover. Native moorland plants responded to fertilizer in the absence of aggressive pasture plants, although this procedure seemed of doubtful value in practice.

High-protein pasture: The rotational or close-grazing system of pasture management, F. T. Shutt, S. N. Hamilton, and H. H. Selwyn (*Jour. Agr. Sci. [England], 22 (1932), No. 3, pp. 647–656*).—Results obtained in 1931 and during the period 1927–1931 in this experiment (E. S. R., 65, p. 33) revealed the high protein character of young grass. Herbage of from 1 to 3 weeks' growth is a rich protein forage, and its dry matter ranges from 20 to 30 per cent of protein. The grass cut for hay contained less than one-half as much protein as the younger grass. The protein content was shown to decline with age; i. e., lengthening the period of growth reduces the percentage of protein. The invasion of white clover as the work proceeded markedly raised the protein content of the herbage. This clover growth seemed to reach a peak in the second or third year and then to decline. A plat cut as hay with aftermath gave the highest yields of dry matter in every year. It was evident that the yields of dry matter decreased with the frequency of cutting. However, the average protein yield of the rotational plats per acre per year exceeded that of the hay plat by about 185 lbs.

A classification of the varieties of field beans, Phaseolus vulgaris, F. H. Steinmetz and A. C. Arny (*Jour. Agr. Research [U. S.], 45 (1932), No. 1, pp. 1–50, figs. 32*).—This classification, based extensively on studies at the Minnesota Experiment Station, describes and classifies four of the economic species of Phaseolus (*P. lunatus, P. acutifolius latifolius, P. multiflorus,* and *P. vulgaris*), and 43 named varieties and 22 selections of field beans. The merits of previous classifications are discussed briefly. Characters found useful in classifying varieties of the common field bean include growth habit of plants; number and length of internodes; character of leaf surface; flower color; time of maturity; pod shape, texture, and color; pod dimensions, width, and length; position, length, and shape of spur; and the dry seed characters—shape, size, color of seed coat, presence or absence of eye markings, and color of eye. Vegetative characters which may be used in describing varieties include size, shape, color, and character of surface of seedling leaves, color of mature leaves and stems, and size and shape of mature leaves.

Variations in amounts of carbohydrates (sugar and starch) in the leaves of corn, L. F. Puhr and A. N. Hume (*South Dakota Sta. Bul. 270*

(*1932*), *pp. 33, figs. 12*).—In the leaves of early and late maturing strains of corn the total sugar was observed to increase rapidly during the day and to decrease at night. The maximum amount of sugar for both strains was between 1 and 4 p. m., and the minimum between 1 and 4 a. m. Insoluble carbohydrates estimated as starch reached a maximum later in the day than did the total sugar, usually between 7 p. m. and 1 a. m., and were at their minimum approximately between 4 and 7 a. m. The nonreducing sugars increased rapidly during the hours of sunshine and decreased at night, and always exceeded the reducing sugars. The variations in the latter were not so well defined and regular as those in nonreducing sugars. Conclusions were that no significant difference exists between the early and late strains of corn used in regard to the daily variation and quantity of sugars and starch in the leaves.

Differential resistance of inbred and crossbred strains of corn to drought and heat injury, M. T. Jenkins (*Jour. Amer. Soc. Agron., 24 (1932), No. 6, pp. 504–506*).—Marked differences in resistance to the leaf burning associated with the drought of 1930 were observed in a number of inbred lines and crosses in corn improvement experiments of the Iowa Experiment Station in cooperation with the U. S. Department of Agriculture. The ten crosses of one line were completely free from leaf burning, whereas those of another line ranged from some to many plants with burned leaves in the different crosses. Indications were that much might be accomplished in breeding for drought resistance.

The effect of the removal of tassels on the yield of corn, W. H. Leonard and T. A. Kiesselbach (*Jour. Amer. Soc. Agron., 24 (1932), No. 7, pp. 514–516*).—The increase in grain yield of 1.5 per cent obtained by the Nebraska Experiment Station as a result of detasseling of Hogue Yellow Dent corn was not significant statistically, suggesting that corn yields are not affected materially by removal of tassels done so as to avoid mutilation of leaves and when satisfactory pollination is otherwise provided.

The effect of pollen source upon the grain yield of corn, T. A. Kiesselbach and W. H. Leonard (*Jour. Amer. Soc. Agron., 24 (1932), No. 7, pp. 517–523*).—The immediate effect of fertilization by foreign pollen upon the grain yield of corn when a change either in endosperm type or in heterozygosity is involved was studied at the Nebraska Experiment Station.

Sweet corn pollinated by sweet corn yielded 38 per cent as much as dent corn, and when pollinated by dent corn it yielded 51 per cent as much as the dent, indicating a 34 per cent increase in the yield of the sweet corn resulting from the transformation from a sweet to a starchy endosperm. Considering the grain yields of individual plants, sweet corn yielded 13 per cent more when pollinated by dent pollen than by its own pollen. For a selfed dent line a difference of 2.2 per cent in grain yield in favor of plants fertilized by unrelated pollen appeared wholly within the limits of experimental error.

A cross pollination naturally occurring in comparative tests of varieties, selfed lines, or hybrids apparently does not modify materially the total yield of grain when there is no accompanying change in endosperm type, whereas the grain yield of sweet corn is enhanced by fertilization with pollen carrying the starchy endosperm factor.

Corn in its northern home, P. J. Olson and H. L. Walster (*North Dakota Sta. Bul. 257 (1932), pp. 41, figs. 17*).—This condensed revision of Bulletin 207 (E. S. R., 58, p. 328) discusses the production of corn in North Dakota and its place and value in the cropping system; recommends varieties for different sections of the State from the reported results of tests at the station and substations; describes important varieties; and comments on the practices of

ensiling and pasturing the crop, sources of seed, causes of poor stands, and weed control.

Falconer and Northwestern, both semidents, are considered the most widely adapted general-purpose varieties, and Dakota White, Gehu, and similar early flint and early flour varieties best for hogging off. Corn yields in different crop rotations, with and without manure, on Fargo clay did not differ much between rotations, although continuous corn unmanured yielded significantly lower than corn in rotations, and its yield had a greater downward trend. The best yield increases from manure were in the rotation wheat, corn, barley, and timothy. Fall applications of manure to Fargo clay for the succeeding corn crop in a 4-year rotation of corn, wheat, clover, and oats effected yield increases ranging from 2 to 5 bu. per acre. Phosphates supplementing the manure tended to give an additonal increase of 2 to 4 bu., whereas either limestone or potassium sulfate was not effective. The residual effects of manure and phosphates upon yields of succeeding crops in rotation, particularly wheat and oats, exceeded the direct effects upon corn yields. The effects of the various rotations and treatments on maturity of corn have been noted (E. S. R., 63, p. 820).

The interrelation of factors controlling the production of cotton under irrigation in the Sudan, F. G. Gregory, F. Crowther, and A. R. Lambert (*Jour. Agr. Sci. [England], 22 (1932), No. 3, pp. 617–638, pl. 1, figs. 5*).—Cotton was grown at the Gezira Research Farm in 1929–30 and 1930–31 with four planting dates, three spacings, light, medium, and heavy irrigations, and with a light nitrogen treatment in all possible combinations. The results were examined statistically by analysis of variance.

The effects of the single factors were highly significant, and the interactions of the factors in pairs were highly significant statistically with the exception of spacing v. water. All higher interactions were highly significant except those involving combinations of spacing and water. Yield, both with and without nitrogen, had optimum value for August planting. The returns in yield for nitrogen treatment declined with advancing planting date. Irrespective of nitrogen application, spacing had little effect with early planting but a large one with late planting. Water supply with early planting and nitrogen had a large effect, and a slight effect with early planting without nitrogen. The effect of water supply tended to disappear with advancing planting date irrespective of nitrogen application. Various combinations of the factors might be utilized to give maximum yield, thus providing considerable latitude in planting date without sacrificing yield. The interaction effects are presented graphically, and their physiological interpretations are discussed.

Cotton quality affected in ginning process by moisture in seed cotton, F. L. Gerdes (*U. S. Dept. Agr. Yearbook 1932, pp. 431–433, fig. 1*).—Compared with cotton ginned when green and damp, cotton ginned after artificial drying in driers developed by the U. S. Department of Agriculture had better quality and staple, the seeds were cleaned more completely, and a better moting action was obtained during ginning.

Correlation studies with strains of flax with particular reference to the quantity and quality of the oil, I. J. Johnson (*Jour. Amer. Soc. Agron., 24 (1932), No. 7, pp. 537–544*).—The percentage and iodine number of the oil and their relation to plant and seed characters were studied at the Minnesota Experiment Station with 46 strains of flax grown in 1929 and 1930 in replicated rod-row plats.

Significant positive simple correlations were determined between oil content and weight of 1,000 seeds, date ripe, and number of days from full bloom to maturity, whereas negative simple correlations were found between iodine

number and these characters, but only the simple negative correlation between iodine number and weight of 1,000 seeds was significant statistically. In partial correlations, a high positive correlation was determined between percentage of oil and weight of 1,000 seeds when either date ripe or days from full bloom to maturity was held constant. A significant partial negative correlation was obtained between iodine number and weight of 1,000 seeds when oil content and either date ripe or days from full bloom to maturity was held constant.

The high multiple correlation between the percentage of oil and variables studied indicated that the oil content of the seed depends considerably on the same factors that condition seed size, date ripe, and number of days from full bloom to maturity. The low multiple correlation of iodine number with these variables suggested that the iodine number is inherited independently of the plant and seed characters studied. Interannual correlations of oil content, seed weight, date ripe, and number of days from full bloom to maturity indicated that these characters are relatively constant in their inheritance.

Adaptation of fiber flax to the South Atlantic States, B. B. Robinson and T. B. Hutcheson (*U. S. Dept. Agr. Circ. 231 (1932), pp. 12, fig. 1*).—Experimental plats of fiber flax were grown on different soil types under different climatic conditions in different locations in the South Atlantic States in cooperation with the Virginia Experiment Station and other agencies.

Lower than average yields were obtained during three years at Swannanoa, N. C. The fiber was of average quality but lacked strength when spun. Conflicting results were given by numerous tests in Georgia, South Carolina, and Tennessee. In general the flax failed, although two crops were average and one was very good. However, the fiber was judged below the average of European fiber. The flax grown at several substations in Virginia returned average yields when fertilized, but the quality of the fiber was slightly below the average of European fiber and was lacking in nature.

Effect of cold storage and age of seed on germination and yield of peanuts, J. H. Beattie, A. M. Jackson, and R. E. Currin (*U. S. Dept. Agr. Circ. 233 (1932), pp. 12, figs. 2*).—Studies over several years in cooperation with the South Carolina Pee Dee Substation, involving several varieties of peanuts, showed that no consistent difference exists in the germination of the seed or in the yield of peanuts obtained from seed stored in cold storage at 32° and 40° F., and in common storage at 70°. The results suggested that cold storage of peanut seed, commonly practiced to prevent spoilage and insect injury, is a safe practice since it does not depress germination or yield. However, the lower germination of and yields from seed stored shelled indicated that severe losses may result from shelling before placing the seed in storage.

Seed peanuts from the 1922, 1923, 1924, 1925, and 1926 crops were stored unshelled in galvanized iron cans in a dry place at about 70° in winter and somewhat higher in summer. Valencia peanuts sustained only a small loss in germination with seed up to 5 years old. Seed of the Improved Spanish variety 3 years old germinated practically the same as 1-year-old seed, but seed kept longer suffered a distinct loss in germination. By proper storage a satisfactory viability of peanut seed evidently should be retained for about 3 to 6 years, depending upon the variety.

Influence of size and shape of plots on the precision of field experiments with potatoes, S. H. Justesen (*Jour. Agr. Sci. [England], 22 (1932), No. 2, pp. 366–372*).—The yields from a uniformity trial with potatoes at Ormskirk were used in investigating the effect of size and shape of plats on the

precision of field experiments. The area was planted uniformly with Ninetyfold potatoes in 103 rows 26 in. apart, and was harvested in single-row plats 33 ft. 7 in. long (one-sixth of the length of the field), totaling 618 plats. In analyzing the data a system of randomized blocks was designed, each block consisting of 5 plats comparable to 5 treatments or varieties.

The analyses demonstrated that up to a certain limit the standard deviation in percentage of the mean decreases when the size of the plats is increased. Further increase of plat size increases the errors, as a lesser part of the soil variation can be removed. Two-row plats show less variation than 1- or 3-row plats, an observation to be explained by row competition. When the area to be used is fixed, smaller plats, due to the greater number of replications, are more efficient than larger ones. However, where border rows are not harvested, 4-row plats are more efficient than 3-row plats. Long and narrow plats are considered more efficient than shorter and wider plats of the same size. Conclusions were that in field experiments with potatoes fairly large plats at least 2 rows wide, and preferably long and narrow strips, should be used.

Experimental error and the field-plot technique with potatoes, R. J. KALAMKAR (*Jour. Agr. Sci. [England], 22 (1932), No. 2, pp. 373–385, fig. 1*).—In a statistical analysis of the uniformity trial with potatoes by Kirk (E. S. R., 61, p. 635), the standard error in percentage of the mean decreased slightly with increase in width up to plats 5 rows wide, but further increase in the width of the plat resulted in a higher standard error. Increase in size of plat resulted in decreased efficiency in the use of the land when the entire plat was harvested; i. e., given a piece of land of certain size, it is advantageous to have a greater replication of smaller plats than fewer and larger plats. Four-row plats proved the most efficient when the border rows were discarded. The superiority of long and narrow plats over shorter and wider ones was demonstrated.

Recurving in sorghums, J. H. MARTIN (*Jour. Amer. Soc. Agron., 24 (1932), No. 6, pp. 500–503*).—Recurving in sorghums appeared to be the result of thick heads being forced out of the side of a too narrow sheath while the peduncle is flexible and unlignified. Broomcorn "crooks" result from the bending over of a heavy brush before the fibers become lignified. Selection of thick compact-headed types of milo or durra for erectness seems to be futile.

Comparison of chamber and field germination tests of soybeans, G. H. CUTLER (*Jour. Amer. Soc. Agron., 24 (1932), No. 7, pp. 544–550, figs. 2*).—Ungraded seed of Manchu soybeans gave 5.04 per cent better germination in the chamber than in the field in a 4-year test at the Indiana Experiment Station. Ungraded seed of Dunfield soybeans gave similar results. However, three strains of Manchu, Nos. 29, 32, and 40, gave a better germination (5.24 per cent) in the field than in the chamber. The condition of the seed, seasonal conditions just after planting, and the condition of the soil appeared to have an important bearing upon the results obtained.

Soybeans under irrigation in Colorado, D. W. ROBERTSON, A. KEZER, and G. W. DEMING (*Colorado Sta. Bul. 392 (1932), pp. 24, figs. 6*).—The highest yields in soybean varietal trials at Fort Collins were made by Minsoy, Wea, and Saskatoon of the yellow-seeded varieties, and Soysota and Black Eyebrow of the dark-seeded sorts. Practices resulting in the best yields included planting in late April or early May, 20-in. rows made with a beet drill, two or more irrigations, furrow irrigations with beans in rows, and frequent cultivation.

Harvesting studies demonstrated that beans harvested when ripe are high in protein and fat, but the quality, especially as to protein, decreases if they are

left to overripen in the field. Soybeans may be harvested before ripening when the leaves are dropping and about 5 to 20 per cent of the pods are yellow, without any loss in quality but with considerable loss in yield. Early harvesting—after the leaves have commenced to drop—affects yield more than the quality of the soybeans.

Planting soybeans and corn together produced lower yields than planting them separately. Broadcasted soybeans produced slightly more hay than soybeans in rows, but the hay had a high percentage of weeds. Oats and peas yielded more hay and matured about a month earlier than the soybeans.

Investigations in crop husbandry.—I. The effects of seed treatments on the germination and yield of sugar beet, F. H. GARNER and H. G. SANDERS (*Jour. Agr. Sci. [England], 22 (1932), No. 3, pp. 551–559*).—Treatments of sugar beet seed to remove part of the tough woody coat were found by experiments at the Cambridge University Farm to be commercially sound. Treatments with strong sulfuric acid accelerated and increased germination, resulting in a greater plant population at harvest and larger yields. Milled seed was usually cheaper and about as effective as seed treated with sulfuric acid.

Census of the varieties of sugarcane planted in Puerto Rico for the 1931–32 crop [trans. title], P. R. KUNTZ (*Puerto Rico Dept. Agr. and Com Sta. Circ. 98 (1932), Spanish ed., pp. 19, pls. 2, figs. 4*).—The census of sugarcane varieties taken in 1932 on 256,415 cuerdas (248,723 acres) showed B. H. 10 (12) to constitute 52.6 per cent of the area; S. C. 12 (4), 21.9; P. O. J. 2725, 7; Uba, 5.7; P. O. J. 2878, 4.3; P. O. J. 36 and 213, 3; and Cristalina, 1.4 per cent. Compared with the data of the census taken by C. E. Chardon in 1928, there was a notable increase in the areas planted to B. H. 10 (12), S. C. 12 (4), P. O. J. 2725, and P. O. J. 2878, and a marked decline in the areas planted to Cristalina, Rayada, Uba, and P. O. J. 36 and 213, reflecting better yields, elimination of diseases, and better crops without extension of the acreage planted. Information is also given on diseases, insects, rainfall, fertilizers used, and the total production and commercial movement of sugar.

Differences of injury by frost to wheat plants grown comparably, L. R. WALDRON (*Jour. Amer. Soc. Agron., 24 (1932), No. 6, pp. 494–500, fig. 1*).—Further information on spring frost injury to spring wheat (E. S. R., 66, p. 825) was obtained at the North Dakota Experiment Station. Severe frosts in April and May injured a certain proportion of plants in rows of Hard Federation and F_5 hybrid selections from crosses where Hope was a parent. A study of uninjured and injured plants of the two groups showed that the injury persisted during the life of the plant with a marked decrease in yield. Injured plants were nearly 10 per cent shorter than the uninjured plants and were about 50 per cent less in number of fertile culms and in grain per plant. The author points out that such injuries must affect the yield per acre, since any increased growth of the uninjured plants above what would have occurred normally would not compensate for the losses of the injured plants which would remain as competitors.

Bald Rock wheat, E. E. DOWN and H. M. BROWN (*Michigan Sta. Spec. Bul. 223 (1932), pp. 19, figs. 7*).—Bald Rock wheat, selected by the station from Red Rock wheat, is described and compared as to earliness, hardiness, lodging, smut resistance, yield, and quality with American Banner, Red Rock, Berkeley Rock, and Trumbull wheat. Bald Rock has awnless red chaff and large red kernels. It is midseason in maturity, comparatively winter-hardy, and resistant to lodging. Its kernels are soft in texture and have a desirable weight per bushel. The protein content of grain and volume of loaf determinations place Bald Rock in the soft, medium-strength group of flours. The yield

tests indicated that Bald Rock has a wide range of adaptability in the wheat belt of Michigan, and that over a period of years this wheat can be expected to equal or outyield the commercial varieties currently grown in the State.

Quality wheat for Ohio, E. G. Bayfield (*Ohio Sta. Bimo. Bul. 158 (1932), pp. 163–168*).—Quality in Ohio wheat, used principally for flour to make soda crackers, pastry, and breakfast foods, differs from that in areas where harder wheats are grown primarily for bread production. Ohio wheat should not be too high in protein content, and only soft winter wheat varieties should be grown. If the grower has a good variety, as Trumbull or Fulhio, he apparently may regulate the quality somewhat under favorable climatic conditions by selecting the right soils and using the correct fertilizer and soil treatments.

Results obtained with 10 varieties grown at various locations in Ohio illustrated the effect of soil and climate upon the quality of Ohio wheat. Soils naturally less fertile, i. e., light-colored soils, produced less protein and fewer bushels per acre than the darker colored and more fertile soils. The sand soils as a class, due to poor water-holding capacity and general fertility, also produced less protein than the heavier-textured soils. A general rise in protein content occurred in proceeding from northeastern to southwestern Ohio. In studies at the station phosphatic fertilizers tended to reduce and lime to increase the protein content, whereas potassium did not have much influence. Indications were that ordinarily top-dressing of wheat in the spring with a nitrogen fertilizer did not increase the protein significantly. Disease and adverse harvesting or storage conditions are also indicated as factors depreciating quality.

Weeds of grass land, H. C. Long ([*Gt. Brit.*] *Min. Agr. and Fisheries Bul. 41 (1932), pp. VI+98, figs. 92*).—The principal weeds infesting pastures and meadows in England and Wales are described and illustrated, with general and specific control measures.

Weedy abandoned lands and the weed hosts of the beet leaf hopper, R. L. Piemeisel (*U. S. Dept. Agr. Circ. 229 (1932), pp. 24, figs. 10*).—The causes, extent, composition, distribution, and development of weedy abandoned lands in the Snake River plains of southern Idaho are discussed and are compared with the general features of the Escalante Valley of Utah, the Mojave Desert, and the San Joaquin Valley of California.

About 13 per cent of a portion (180,000 acres) of the Snake River plains are denuded lands covered with weedy stands composed largely of tumbling mustard, flixweed, green tansy mustard, and Russian thistle, hosts favorable to the feeding and breeding of enormous numbers of the beet leafhopper (*Eutettix tenellus* Baker). The original cover and also grass covers do not favor leafhopper development. When the reestablishment of the original vegetation on such denuded tracts was traced from the time of abandonment for agricultural purposes, the plant cover in the intervening stages was found to be successively the weeds of irrigated fields, annual weeds of semiarid lands, annual and perennial grasses, and finally shrubs.

From the viewpoint of reduction in numbers of the weed hosts, downy bromegrass was the most rapid and most effective cover over large tracts. With unrestricted grazing, the greatest single factor retarding the reestablishment of the original vegetation, it seemed doubtful if stands of palatable perennial grasses could effectively cover and hold the ground to exclude the weed hosts. Plantings also were considered ineffective unless grazing is controlled. Under current conditions sagebrush appeared to be the most effective and in the long run the most rapid cover, although the most economical use of the land would call for a perennial grass cover.

HORTICULTURE

Results of paper mulch experiments with vegetable crops, H. C. Thompson and H. Platenius (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 305–308*).—At Cornell University records taken on the yields of beans, beets, cabbage, and tomatoes from 1928 to 1931 and on peppers and muskmelons from 1929 to 1931 showed significant increases from the use of paper mulch as compared with cultivation in the case of tomatoes and peppers and a barely significant decrease in the case of beets. With respect to earliness, paper markedly increased the early yield of tomatoes, peppers, and muskmelons and was for this reason profitable with these crops.

Soil temperature readings at 3 and 6 in. showed but little difference between the two systems of culture, except that under paper the soil did not cool down as much at night. Paper conserved more moisture than clean cultivation, and nitrate nitrogen was generally higher under the paper, due apparently to a slightly higher moisture content and somewhat warmer temperature.

[Horticulture at the Raymond, Miss., Substation], H. F. Wallace (*Mississippi Sta. Bul. 299 (1931), pp. 12–16*).—Results are presented, largely in tabulation, of varietal and fertilizer trials with tomatoes, peas, and beans (E. S. R., 65, p. 39).

Effect of extending the cutting season on the yield of asparagus, H. A. Jones (*California Sta. Bul. 535 (1932), pp. 15, figs. 3*).—Records taken over a period of years on Palmetto asparagus plants, set in the early spring of 1924 and separated into two groups one of which (A) was cut to the close of the usual harvesting period and the other (B) continued 2 weeks longer, showed that the number of spears produced per plant increased from year to year with both treatments. Because of the longer cutting period, the B plats produced more spears per plant than did the A plats. When each group was divided into male and female plants, the yield of spears per plant was significantly higher in the males in the B than in the A plat. In the females there was no significant difference in yield between the A and B plats. In both sexes the highest yield of the two largest grades of spears was obtained from the A plats.

As concerns mature stalks, there was a gradual but rather irregular increase in the number produced per plant from year to year, with no significant difference between A and B plats. The average weight of stalks produced per acre was significantly greater in the A than in the B plats.

Self-sterility and fertility in garden beets as indicated by seed production under paper bags, R. Magruder (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 328–331*).—Following a preliminary account (E. S. R., 64, p. 34), this paper discusses the results obtained in covering a large number of beet plants grown from roots the seed of which was obtained from two neighboring plants of the Detroit Dark Red variety. Of 142 mother plants, 116 produced no enlarged ovaries. Of the remaining 26, 8 produced no seedlings, making a total of 87.3 per cent that were self-sterile. Of the remaining 18 plants 3 set 27 per cent under the bags. Not only was the percentage of set high but the percentage of viable seed balls and number of seedlings per viable seed ball was also high, indicating that these 3 plants were strongly self-fertile. Three seedlings per seed ball were not uncommon, and at times 4 and 5 embryos were present.

Premature seedstalk formation in table beets.—Preliminary report, E. Chroboczek (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 323–327*).—At Cornell University beets exposed in the spring of 1930 to relatively low temperatures for 30 days prior to transplanting to the field developed a considerable percentage of seeders. In a greenhouse experiment beets sown at different

dates in a house maintained at 60 to 70° F. were after preliminary exposure for over a month to 40 to 50° removed to three situations, 50 to 60°, 60 to 70°, and 70 to 80°. Part of each lot was grown with ordinary daylight and part given 5 additional hours of electric light.

With the exception of one plant all those in the 50 to 60° house went to seed, whereas in the 70 to 80° house not a single plant developed flower stalks, regardless of previous temperature or length of the photoperiod. In the 60 to 70° house the additional 5 hours of light shortened by 33 days the time required for seed-stalk formation, suggesting that for flowering of the beet both proper temperature and adequate day length are essential. However, once seed-stalk formation was initiated, higher temperature accelerated the development of blooms.

Studying the effect of freezing, the author found that plants started in the medium-temperature house and exposed for 2 months to 40 to 50° and then frozen formed seed stalks about 5 weeks earlier and in slightly greater amount than did similar unfrozen plants. Freezing had no effect in the case of plants grown before and after the frost treatment in a 60 to 70° house.

Carrot seed germination, H. A. Borthwick (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 310–314, fig. 1*).—Further studies at the California Experiment Station upon carrot reproduction (E. S. R., 67, p. 247) showed that over 90 per cent of the carrot seed is usually produced in the first three orders of umbels, and since the number of first, second, and third order umbels is established as early as the middle of March under California conditions, the position in which the greater part of the crop is to be borne is determined early. Data are presented on the average number of umbels of each order, on the weight and quality of seed by orders, and on delayed germination.

Carbohydrate and nitrogen metabolism in the celery plant as related to premature seeding, H. Platenius (*New York Cornell Sta. Mem. 140 (1932), pp. 66, fig. 46*).—In this study, including two greenhouse crops and one field crop of Golden Self Blanching celery, it was found that the first morphological differentiation leading to the development of seed stalks occurred at least 10 days before the composition of the plant was noticeably changed, indicating that chemical changes are apparently the result rather than the cause of physiological changes. The growth period of "seeders" is tentatively divided into three stages with respect to chemical changes, (1) an initial period of low temperature treatment altering the composition, (2) a main growing period during which composition is controlled by environmental conditions, and (3) the formation of seed stalks associated with pronounced chemical changes.

That a high carbohydrate content was not essential to premature seeding was shown in the production of seeders under low temperature conditions from young plants of extremely low sugar content. Consistently higher carbohydrate-nitrogen ratios were found only during the third stage, giving further evidence that chemical changes follow rather than induce morphological changes.

Regardless of the temperature under which plants were grown in the greenhouse, the same periodic fluctuations occurred in the percentage of sugar in all lots, daily changes in moisture content and age of plants apparently being contributing factors. During the growing season the percentage of total nitrogen based on dry weight decreased at about the same rate as did that of carbohydrates. Exposure of young plants to low temperature increased protein and decreased soluble nitrogen. Whenever amino nitrogen increased nitrate nitrogen decreased, and vice versa. A less consistent inverse rela-

tionship was found between amino and protein nitrogen, suggesting that protein is the result of a polymerization of amino acids.

A considerable increase in metabolic activity, displayed in a higher growth rate and a more rapid synthesis of carbohydrates in the seeder than in the vegetative plants, was observed.

Some factors affecting the color and thickness of onion scales, J. E. KNOTT (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 318–322*).—The application at Cornell University of various fertilizers and chemicals to a muck soil which had produced poorly colored onions failed in preliminary trials to influence color, although the scales were slightly thickened by some of the treatments. In a second experiment in which sufficient superphosphate was added to the poor color soil to bring its phosphorus content up to that of a good color soil the increased phosphorus did improve color as well as thicken the scales. Copper sulfate again had no appreciable effect on the onions.

However, in a third test in which fertilizer applications were increased copper sulfate produced striking results, yielding the best colored onions and the thickest scales of any of the treatments. In field trials at Elba added phosphorus improved color, while potash had no influence. The thickest scales were found in the onions from the supplemental phosphorus plats. A slightly better colored onion was obtained in Orange County tests following the application of 100 lbs. of copper sulfate per acre.

The effect of drainage depth on yield and quality of onions when grown on peat land, T. M. CURRENCE (*Minn. Hort., 59 (1931), No. 5, p. 114; abs. in Minnesota Sta. Rpt. 1931, p. 44*).—On the basis of an average of 3 years' yields, onions were most productive when grown on soil with the water table held at a 4-ft. depth, although there were no material differences in yield in the 2- to 6-ft. range. The maximum percentage of thick-necked onions occurred at the 4-ft. water level, and, making due allowance for these scullions, the highest percentage of marketable onions occurred at the 3-ft. water level. Moisture determinations of the onions made for 1 year only showed very little difference, the range being from 87.2 per cent for the 5-ft. water level to 89.2 per cent for the 1-ft. level.

Some effects of wounding onion bulbs on seed production, A. L. WILSON (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 336–341*).—In five of seven years wounded Riverside Sweet Spanish onion bulbs produced at the Utah Experiment Station larger yields of seed than did comparable uncut bulbs, and in the two off years injury to the earlier appearing plants of the cut bulbs from a belated freeze and from a severe windstorm contributed to the results. A higher seed yield obtained from cut bulbs is attributed not only to a better stand and more stems per plant but also greater vigor.

Chemical examination of cut and uncut bulbs held under identical conditions showed at the close of 10 days an increase in total sugars in the stems and a slight decrease of sugars in the scales of the cut bulbs. The percentage of both soluble and insoluble nitrogen was lower in cut stems. The author believes that some of the changes in sugar content are associated with the decrease in total nitrogen. A suggestion was obtained that catalase activity is greater in the cut bulbs.

Spinach varieties, H. DREWES (*Michigan Sta. Spec. Bul. 225 (1932), pp. 48, figs. 26*).—Beginning with a general discussion of the spinach plant and its flowering habits, there are presented technical descriptions of a large number of spinach varieties, classified according to smoothness of the leaves and the character of the seeds.

Effects of ringing on growth and fruiting in the tomato, C. E. Steinbauer (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 343–349*).—Bonny Best tomatoes growing in the field at the Minnesota Experiment Station and ringed at different stages of development by constricting the stems with wire and also by cortex removal showed reduced yields of ripe fruit in all cases. The time of treatment was a potent factor, the earlier the operation the greater the reducing effect on yield. The ability of wounds to heal over greatly increased after flowering had begun; nearly all of those made after the third truss began to bloom healed. At least 90 per cent of the cortex removal wounds healed. In no case was there a significant hastening in maturity due to ringing; in fact more often retardation resulted.

Vegetative propagation of deciduous fruits, W. L. Howard (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 465–469*).—A discussion of the present status of knowledge regarding asexual propagation, with practical suggestions as to procedure.

Experiences in rooting soft and hardwood cuttings of hardy fruits, H. B. Tukey and K. Brase (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 460–464*).—Attempts at the New York State Experiment Station to grow apples, sweet cherries, plums, and pears from softwood cuttings were generally unsuccessful, although a few strong plants of the DeCaradeuc plum were secured. Peat and sand was the most satisfactory medium. Hardwood cuttings of five standard apple varieties failed completely, whereas good success was secured with two of the East Malling apple stocks, I and IX, when 2-year wood was taken. Angers quince cuttings with heels of 2-year wood rooted very satisfactorily.

Sprays for the protection of trees against sunscald and rodent injury, R. B. Harvey (*Amer. Soc. Hort. Sci. Proc., 27 (1930), pp. 548, 549, pls. 3; abs. in Minnesota Sta. Rpt. 1931, p. 36*).—In comparison with several commonly used repellents, a new sulfonated oil, which is made by heating linseed oil to 470° F. and then adding 10 per cent of powdered sulfur, was found to be very effective in preventing rabbit and mouse injury to young trees. When painted on the tree trunks it lasts over winter and gives excellent protection.

Carbohydrate and nitrogen relationships in apple shoots as influenced by soil management, J. T. Sullivan and F. P. Cullinan (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 519–525*).—Studies made at the Indiana Experiment Station over a 3-year period on the chemical composition of the terminal shoots of Grimes Golden trees growing under tillage, alfalfa, and bluegrass showed some effect of the system of culture. Shoots of trees receiving tillage with cover crop had a higher content of total nitrogen in percentage of dry weight during the growing season than did the other two lots, the differences being greater in the growing than in the dormant season. Starch reached a maximum in autumn and was highest in the sod-grown trees and least in the tilled trees. Differences in total sugars were not sharply defined between the plats.

As concerned growth, trees with the highest total nitrogen in their terminal shoots showed the greatest increment in trunk circumference. The growth of trees in alfalfa was better than in sod but not equal to that of the tilled trees. In part of the cultivation cover crop area trees made about as good growth without as with nitrogen, while in another section low in organic matter nitrogen fertilizers improved leaf color and tree growth.

Autumnal migration of nitrogen and carbohydrates in the apple tree with special reference to leaves, A. E. Murneek and J. C. Logan (*Missouri*

Sta. Research Bul. 171 (1932), pp. 30, figs. 16).—In studies of the autumnal migration of nitrogen and carbohydrates from the leaves of spring nitrated Grimes Golden, Delicious, Stayman Winesap, and Jonathan apple trees, it was found that approximately 22 to 40 per cent of the nitrogen in percentage of dry weight was reabsorbed by the tree prior to leaf abscission; hence, leaves frozen before yellowing occurs or removed prematurely by winds or other agencies may considerably decrease the nitrogen reserve of the tree itself. The nitrogen content of leaves decreased from the time active growth ceased until complete defoliation. At the same time the percentage of nitrogen in nonbearing spurs and twigs increased rather uniformly, with evidence that much of the reabsorbed nitrogen is later translocated to older wood and probably to the roots.

Carbohydrate movement was not so clearly defined, since with the onset of cold weather starch and possibly complex carbohydrates are hydrolyzed simultaneously into sugars in all the peripheral regions of the tree. Hence modifications induced by weather may easily be greater than those resulting from seasonal trends.

The application of the findings to pruning practice and to the possible control of the carbohydrate-nitrogen ratio within the tree are discussed.

Nitrogen intake and translocation in apple trees following fall, winter, and spring sodium nitrate applications, W. W. Aldrich (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 532–538*).—In this study, conducted jointly by the U. S. Department of Agriculture and the Maryland Experiment Station, small nitrogen-deficient York Imperial trees supplied with 10 lbs. each of nitrate of soda at different seasons were analyzed with respect to the nitrogen content of rootlets, medium-sized roots, terminal shoots, and spurs. Between November 1 and January 1 the total nitrogen in the rootlets of trees nitrated on November 1 increased 50 per cent as compared with a maximum of 16 per cent in checks. Rootlets of trees nitrated on January 1 increased 30 per cent in nitrogen content between January 1 and March 5. Trees nitrated on March 5 behaved similarly to the checks, suggesting the possibility that nitrogen may have moved out of the rootlets into the tree.

Determinations of the nitrogen content of medium-sized roots indicated that winter nitrogen taken up by the rootlets moves into the larger roots, and that such translocation continues during the 3 to 4 winter months when nitrogen is applied in the fall or winter. At the time of full bloom the medium-sized roots of the nitrated trees contained more nitrogen than did those of the controls, indicating that the larger roots may function as storage tissues.

In terminal shoots nitrogen increased slowly during winter and rapidly just prior to the commencement of growth. Up to March 5 the terminals of the November 1 and January 1 nitrated trees showed approximately the same nitrogen changes as the checks, but thereafter did not show the significant nitrogen increases displayed by the check trees. Nitrogen translocation from storage tissue to terminals apparently did not occur to any great extent until growth had started.

With respect to the spurs, none of the nitrated groups showed significantly higher nitrogen in the spurs up to and including the April 15 samples. On May 15 all nitrated lots showed higher nitrogen content in the old and new growths, leaves, and blossoms. The total nitrogen content of the spurs was not influenced by nitrogen applications until new growth was in development.

The nitrogen supply for young apple trees growing in leguminous and nonleguminous sod, A. J. Heinicke (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 526–531*).—Analyses at the New York Cornell Experiment Station of

leaves collected approximately 6 in. from the base of representative terminal shoots of apple trees growing under different systems of culture and fertilization showed the least nitrogen in percentage of dry matter for trees in grass sod without supplemental nitrogen. The largest amount of nitrogen occurred in the leaves of trees under cultivation, with the alfalfa sod trees intermediate. Nitrogen fertilizer increased the nitrogen content of leaves of cultivated trees and also stimulated growth, as measured in trunk girth. A comparison of girth increments in the several plats indicated that more than the optimum amount of nitrogen was present in the leaves of the nitrogen supplied alfalfa sod and cultivation cover cropped trees. A lower nitrogen content in leaves in October than in June suggested a movement from the leaf to the wood.

From the data the author concludes that alfalfa and grass take up and hold considerable nitrogen, and that early and frequent cutting is advisable to hasten the decomposition and availability of such grass. Soil moisture observations suggested that the ability of trees to use available moisture depends to a certain extent on the nitrogen supply within the tree.

The relation of soil moisture and spray applications to stomatal behavior and growth of Jonathan apples, F. L. Overley, E. L. Overholser, and I. A. Haut (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 543–546, pls. 2*).—Conducted in the Wenatchee district by the Washington College Experiment Station, this study showed no variation in stomatal response to soil moisture between the wilting point and field capacity. However, with high air temperature and low relative humidity earlier closing did occur, even with adequate soil moisture. Volumetric measurements showed a gradual and comparable increase in fruit size on all plats.

Of four sprays, (1) lead arsenate, (2) lead arsenate and spreader, (3) rotenone, and (4) lead arsenate and oil emulsion, none had any significant differential effect on stomatal behavior. On branches with controlled leaf area per fruit there was no difference in the rate and character of size increase of fruits with reference to spraying, except on the plat receiving lead arsenate alone. In this case the growth of fruit was less throughout the season. The average size and color of harvested apples varied with the several treatments, due probably to a difference in the size of crop per tree or leaf area per apple rather than to spray or irrigation practice.

Relation of moisture supply to stomatal behavior of the apple, J. S. Furr and E. S. Degman (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 547–551, figs. 2*).—Records taken by the U. S. Department of Agriculture on irrigated and nonirrigated Grimes Golden and Delicious apple trees located at Hancock, Md., showed that variations in soil moisture supply have a measurable though slight influence on fruit growth and a marked influence on stomatal behavior, even when the soil moisture is several per cent above the wilting percentage. Stomatal behavior is believed to be an index to leaf function, so much so that environmental conditions which noticeably influence stomata may not show immediately measurable influences on the growth rate of the fruit. The crops carried by the experimental trees were rather light, and it is deemed probable that with more fruit the differences in fruit growth between the plats would have been more pronounced.

Respiration of apple twigs in relation to winter hardiness, W. A. De Long, J. H. Beaumont, and J. J. Willaman (*Plant Physiol., 5 (1930), No. 4, pp. 509–534, figs. 7; abs. in Minnesota Sta. Rpt. 1931, p. 20*).—Measurements at the University of Minnesota of the carbon dioxide output of excised apple twigs showed a definite influence of the previous temperature environment on respiration. Where the previous temperature was low, there was a peak of

carbon dioxide evolution for several hours, after which a level was reached. Where the previous temperature was relatively high, a constant level was attained without any such peak. The lower the previous temperature the higher the peak, with definite indication that the natural hardiness of the variety was a factor. In the eleven varieties studied increasing tenderness coincided almost exactly with that of increasing carbon dioxide during the peak. Twigs stored at —2, —6, and —10° C. for periods up to 30 days with and without aspiration of the air showed no striking changes in chemical composition. Wound respiration was shown to be a small and relatively constant fraction of the total respiration.

A comparison of the variability in growth of several varieties of apple trees growing on seedling roots and upon their own roots, F. S. Lagassé (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 475–484, figs. 3*).—In a comparison at the Delaware Experiment Station of own rooted and budded Yellow Transparent, Stayman Winesap, Delicious, Grimes Golden, and Rome Beauty trees, the own rooted, although much more variable in weight, height, and trunk circumference at the start of the experiment than seedling rooted trees, remained quite constant during the first three years after planting with respect to variability, whereas the seedling rooted trees showed significantly increased variability. For example, Stayman Winesap own rooted and seedling rooted trees had respective coefficients of variability in trunk circumference of 18.78±1.42 and 8.19±0.62 at planting and 20.6±1.57 and 17±1.35 three years later. Scion rooted trees made good growth, averaging nearly the same as the seedling rooted trees at the close of the test.

The author concludes that the results obtained in the three growing seasons indicate the uniform type of growth made by scion rooted trees.

A study of growth of pear inarches, L. D. Davis and W. P. Tufts (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 485–488, pl. 1*).—At the University of California diameter measurements of 700 odd pear inarches failed to show any significant difference in growth in relation to the time of the grafting. No correlation was found between the initial size of an inarch and its increment during 1, 2, and 3 years following grafting. Inarches with tops uncut made a greater growth, but the differences largely disappeared by the close of the third year. The variety of the tree inarched had some effect on the growth of the inarch, being less in Bartlett than in Beurre Bosc, Beurre Hardy, and Winter Nelis.

The harvesting and handling of fall and winter pears, F. W. Allen (*California Sta. Bul. 533 (1932), pp. 46, figs. 3*).—Continuing studies (E. S. R., 61, p. 737), the author found that fall and winter varieties behaved much as the Bartlett, that is, fruits harvested immature either failed to ripen properly or ripened with poor quality and a tendency to shrivel and scald. Color and firmness changes were less marked in these late pears than in Bartlett but supplied a valuable index to maturity. Fruits harvested before showing changes in original ground color failed to develop optimum color, flavor, and texture and sometimes failed to ripen at all. Pressure tests were again found an important aid in determining picking maturity but were influenced by various factors, such as climate, rootstock, and size of crop on the tree. For example, pears grown near the coast usually had less color and a slightly softer texture than those grown under higher temperature and lower relative humidity. Summarized recommendations are presented for the proper degree of color and firmness at which to harvest Anjou, Beurre Bosc, Beurre Clairgeau, Comice, Easter Beurre, Forelle, Glou Morceau, Beurre Hardy, Howell, and Winter Nelis pears.

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The cooling after harvest and the temperature at which pears are stored or shipped were found important factors in determining the rate of ripening. Late varieties such as given ripen best after a period of storage with removal to 60° F. or above for a short time prior to actual use. Internal and surface breakdown, shriveling, scald, and fungus rots were found the chief causes terminating the storage life of pears.

Growth of fruit and stomatal behavior of Elberta peaches as affected by weather conditions, J. H. Weinberger (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 539–542, figs. 2*).—Daily measurements of Elberta peaches on 20-year-old trees in the University of Maryland orchard showed practically all growth increase to occur during the night. Frequently in the afternoon of warm days fruits were actually smaller than on the preceding day. A rapid growth spurt was made in early August despite drought, and abundant rains following drought periods greatly stimulated growth.

That stomatal behavior was more closely associated with daily temperature and humidity than was fruit growth was indicated in observations during periods of drought and of rainfall. The removal of fruits from Elberta trees resulted in an earlier closure of the stomata. Stomatal movement and fruit growth were correlated to the extent that during hot, dry periods the stomata functioned only briefly and fruit growth was materially inhibited, with a converse situation prevailing during humid periods.

Influence of size of mahaleb seedlings on nursery grades, C. L. Burkholder and L. Greene (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 473, 474*).—Correlation coefficients of 0.685±0.0158, 0.654±0.0098, 0.661±0.021, and 0.7209±0.0146 were determined at the Indiana Experiment Station between the size of mahaleb cherry seedlings and the size of the 1-year tree for 1928–29, 1929–30, and 1930–31 irrigated and 1930–31 nonirrigated lots, respectively. Irrigation in 1930 increased the average diameter of seedlings from 0.49 to 0.57 in., and in view of the strong correlations indicated that size of 1-year trees may be considerably influenced by growing conditions during the seedling stage. Of the 315 seedlings irrigated in 1930, 66 per cent produced trees $\frac{11}{16}$ in. or better in diameter in the fall of 1931 as compared with 45 per cent for 492 nonirrigated trees.

Transpiration rates in old and new canes of the Latham raspberry as measured by non toxic dyes, W. G. Brierley (*Amer. Soc. Hort. Sci. Proc., 27 (1930), pp. 152–157, fig. 1; abs. in Minnesota Sta. Rpt. 1931, p. 36*).—Supplying dye solutions to the cut end of some of the roots of raspberry plants beginning to ripen their fruit, the author observed that within 20 to 22 hours the dyes had reached the uppermost laterals of the fruiting canes, while none was noted in the tips of young canes. The dye solutions were confined to the xylem, the inner and outer boundaries of which were clearly defined. Repetitions of the test showed the old canes to transpire more rapidly until about the close of the harvest period, when the rates tended to become nearly equal. On August 18 the transpiration rate was considerably greater in the new canes, and this relation persisted until the end of September.

As a practical deduction the author suggests the advisability in dry seasons of removing old canes immediately after they cease fruiting.

Thickness of cuticle in cranberry fruits, N. E. Stevens (*Amer. Jour. Bot., 19 (1932), No. 5, pp. 432–435*).—Measurements taken over a period of three years upon the thickness of the cuticle of numerous varieties of Massachusetts grown cranberries showed a considerable variation, ranging in 1929 from 9.9 μ in Early Black to 13.7 in Paradise Meadow. For any given cranberry variety the cuticle was thicker in 1929 than in either of the two subsequent years.

The differences in cuticle thickness could not be correlated with size of fruit, keeping quality, or prevailing weather conditions.

Variations in citrus seedlings and their relation to rootstock selection, H. J. Webber (*Hilgardia [California Sta.], 7 (1932), No. 1, pp. 79, figs. 15*).—Having discussed in an earlier paper (E. S. R., 67, p. 532) the economic importance and the prevalence of apogamy in citrus, the author points out that except with forms 100 per cent apogamic there is a considerable percentage (5 to 40) of highly variable types which apparently differ in genetic constitution from the prevailing type and from each other. These variants are shown to be an important factor in increasing the variability of certain quantitative factors, such as size of plant and fruit, size of crop, longevity, etc. The variants are believed to have developed from normally produced sexual embryos, largely by self-fertilization. They are usually small and lacking in vigor and when used as stocks almost invariably produce trees exhibiting some dwarfing.

The relation of the size of seedlings to size of young trees was shown in correlation coefficients of 0.736 ± 0.016 and 0.437 ± 0.028, respectively, between cross section of trunks of seedlings and those of young budded trees and 8-year orchard trees. When the variants were excluded the correlations were greatly reduced in the older trees, indicating that there was a temporary relation between size of selected seedlings and size of orchard trees. The coefficients of variability for size of tree gradually decreased as the trees grew older.

The accumulated evidence from the various experiments and computations suggest that in general with complete populations small seedlings and small nursery trees tend to produce small, low yielding trees, and conversely large seedlings and large nursery trees tend to produce large, productive trees. The desirability of eliminating variants by discarding the second grade seedlings is stressed.

The pecan in Arizona, A. F. Kinnison and A. H. Finch (*Arizona Sta. Bul. 140 (1932), pp. 669–708, figs. 18*).—This bulletin supplants and amplifies Timely Hints for Farmers No. 154 (E. S. R., 55, p. 40).

Variation in the tung-oil tree, H. Mowry (*Florida Sta. Bul. 247 (1932), pp. 32, figs. 23*).—Stating that the entire Florida acreage (10,000 acres) of tung-oil trees is entirely seedling in nature, the author presents the results of studies on the extent and nature of variations and the possibility of perpetuating desirable types.

The total yield of air-dry seeds from several 18-year-old trees varied from 7.625 to 164.75 lbs. in 1931 and for four years combined from 21.5 to 481.25 lbs. Individual weights of air-dry fruits varied from 0.44 to 2.08 oz., the number of seeds per fruit from 4.11 to 7.28, and seeds per pound from 85 to 227. The oil content per 100 lbs. of air-dried fruits ranged from 17.04 to 24.53 lbs. Indications were seen that the nutrition of the tree influences the filling of the seed kernels and incidentally the percentage of oil.

The author suggests that desirable strains may be propagated by asexual means, and that although the fruit characters of seedlings agree with those of their parent there is a wide variation in the yield of related seedlings. Descriptions are presented of the Craig, Moore, and Florida varieties.

Tung oil: Economic and commercial factors in the development of a domestic tung oil industry, C. C. Concannon (*U. S. Dept. Com., Bur. Foreign and Dom. Com., Trade Prom. Ser. 133 (1932), pp. V+106, figs. 27*).—This publication discusses the production and consumption of tung oil in China, the export trade of that country, the present and potential uses of tung oil, the commercial possibilities of some other lesser known drying oils, the tung tree plantings in the United States and other countries and the cultivation and

fertilization of trees, the harvesting of the nut crop, and oil expression in the United States. Appendixes include the Chinese regulations for testing tung oil, the Oriental Oils Association rules for trading, the standard specifications for tung oil, and a bibliography.

Studies in propagation of softwood cuttings of ornamentals based on temperature, defoliation, and kind of media, H. C. Esper and L. R. Roof (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 452–454*).—At Ohio State University 70° F. in the rooting medium was found more satisfactory than 60° for rooting cuttings of various ornamentals, such as chrysanthemums, geraniums, and petunias. Where different amounts of leaf area were removed, root development was correspondingly decreased, leading to the suggestion that with the exception of large leafed species, such as hydrangea, any defoliation is harmful. Of various media, combinations of peat and slag and of peat and sand were the best.

Factors influencing the rooting of deciduous hardwood cuttings, L. C. Chadwick (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 455–459*).—In studies at Ohio State University dogwood, privet, and Morrow honeysuckle cuttings taken in winter and early spring rooted better than those taken in late autumn. Little difference was noted whether the cuttings were stored in sand or in a mixture of sand and peat moss. Cuttings with the base 0.5 in. below the node rooted somewhat better than those severed above the node. Some indication was seen that the storage of cuttings for 2 weeks at 60° F. and removal to 40° was beneficial.

Rooting response of conifers to treatments with organic and inorganic compounds, I. Klein (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 447–451*).—At the Ohio State University, cuttings of *Thuja occidentalis, Chamaecyparis pisifera plumosa, Juniperus sabina, J. chinensis pfitzeriana,* and *Taxus cuspidata* taken in November and December rooted better than those taken in late winter and very early spring. Of various materials tested as stimulants, potassium permanganate and sugar compounds were generally most successful as measured in length and number of roots formed. In records taken on July 25, the potassium permanganate treatment had given the best results with *Thuja occidentalis, J. sabina,* and *T. cuspidata,* and was equal to 5 and 10 per cent glycerine with *C. pisifera plumosa* and to water in the case of *J. chinensis pfitzeriana.*

FORESTRY

Utilization of bigleaf maple of the Pacific Northwest, H. M. Johnson (*U. S. Dept. Agr. Circ. 225 (1932), pp. 36, pls. 2, figs. 12*).—The bigleaf maple, stated to compare favorably in many of its physical and mechanical properties with the eastern United States maples, is deemed valuable, due both to its intrinsic qualities and to the scarcity of other hardwoods in the Pacific Northwest. Information is presented on the distribution of the species, annual production, properties, utilization, methods of lumbering, transportation, stumpage, log and lumber values, etc.

A new transplant board, T. Schantz-Hansen (*Jour. Forestry, 28 (1930), No. 8, pp. 1153–1156, figs. 4; abs. in Minnesota Sta. Rpt. 1931, p. 42*).—A description is presented of a new transplant board developed at the Cloquet Forest Experiment Station for handling coniferous seedlings.

Ohio Forest News, [September, 1932] (*Ohio Forest News [Ohio Sta.], No. 19 (1932), pp. 8, figs. 2*).—General information is offered on forestry matters, such as benefits from fuel-wood cutting, first Forestry Day at Wooster, list of junipers growing in the Wooster arboretum, etc.

DISEASES OF PLANTS

Disorders of plants, A. Beraldi (*Malattie delle Piante. Milano: Ulrico Hoepli, 1929, pp. XII+482, figs. 248*).—This little volume deals mainly with plant diseases, but it has a fourth chapter on animals as causes of loss to plant producers and handlers. A short bibliography and an index complete the publication.

Review of the diseases of cultivated plants in the environs of Saratov in 1929 [trans. title], A. A. Prisiāzhniūk (Prisiajnuk) (*Zhur. Opytn. Agron. Ūgo-Vostoka* (*Jour. Agr. Sci. S.-E. of U. S. S. R.*), *8 (1930), No. 2, pp. 337–353; Eng. abs., p. 353*).—Study of plant diseases under the conditions in the arid climate of this region shows that the local parasitic flora differs greatly from that in other parts of the Union of Soviet Socialist Republics, the diseases differing from those due to the same parasites in other regions of the country. This condition results from causes which are numerous and complicated.

Wheat shows a resistance to fungus diseases corresponding to the existing biological races. Morphological and physiological characters of the hosts, as well as those of the parasites, are factors in the production of this condition. Locally, all the hard varieties of wheat are notably resistant. The resistance of hard wheats to loose smut is connected with the mechanism of blooming. The 62 line stands first in resistance. Resistance depends upon physiological properties, chiefly high growth energy. Loose smut is very prevalent in the region named. The branching varieties of millet are not attacked by bacteria. Of the soft wheats, the most highly resistant to smut were lines 721 and 341. Early sowings of spring wheats are less affected by rust than late sowings. The development of resistant varieties is regarded as the most radically effective means of protection against fungus diseases.

Phytopathological report [trans. title], T. H. Thung (*Proefsta. Vorstenland. Tabak [Netherland East Indies], Meded. 69 (1930), pp. 21–40, figs. 7*).—This includes an account of weather and other conditions, of corresponding plant diseases, and of attack by animals.

Infection conditions of Puccinia glumarum and P. graminis [trans. title], G. Gassner and W. Straib (*Arb. Biol. Reichsanst. Land u. Forstw., 16 (1928), No. 4, pp. 609–629*).—This work corresponds to that previously reported by Gassner and Appel (E. S. R., 61, p. 534), continuing numerically their literature list so as to include, with that work, 48 publications. The investigation is now extended to include *P. glumarum* and *P. graminis*, regarding each of which details are given as to the significance of air, humidity, temperature, and light.

The effect of winter oils on host plants, E. R. DeOng (*Calif. Dept. Agr. Mo. Bul., 20 (1931), No. 2, pp. 176–180*).—Conditions, applications, and results are detailed, with emphasis on avoidance of common errors.

Treatments against cereal diseases [trans. title], A. E. Tråen (*Nord. Jordbrugsforsk., 1929, No. 4–7, pp. 588–591*).—A brief review is given indicating results from a number of seed treatments against rust or smut with dissolved or dusted chemicals bearing commercial brands.

Preliminary experiments on the control of cereal rusts by Kolo dust, W. C. Broadfoot (*Phytopathology, 21 (1931), No. 4, pp. 347–372; abs. in Minnesota Sta. Rpt. 1931, pp. 29, 30*).—Experiments are reported upon the control of cereal rusts with a form of colloidal sulfur, in which dusted plats of the wheat varieties Marquis, Ruby, and Mindum were compared with nondusted plats. There was no evidence of control of stem rust with one application of the dust, but the yield, weight per bushel, and grade were slightly higher on the treated plats. For practical purposes two applications of dust were almost as effective as three, and used at the rate of 15 lbs. was as effective as when

applied at greater rates. The most effective schedules for two applications were at flowering time and six days later, and at flowering time and eight days later. The dust did not prevent the setting of seed, and no injury was observed. When applied to the soil at flowering time the dust had no effect on the amount of stem rust or other characters studied.

Cereal black rust problems [trans. title], J. I. Liro (*Nord. Jordbrugsforsk., 1929, No. 4–7, pp. 555–559*).—A briefly discussional account is given of the occurrence and problems of cereal black rust (*Puccinia graminis*) before and since its comparatively recent appearance in Scandinavian and neighboring countries.

The relation of physiologic specialization in Tilletia to recent epiphytotics of bunt in durum and Marquis wheats, C. S. Holton (*Phytopathology, 21 (1931), No. 6, pp. 687–694, fig. 1; abs. in Minnesota Sta. Rpt. 1931, p. 33*).—The virulence of 4 collections of *T. tritici* and 2 collections of *T. laevis* was compared on 10 varieties of Triticum. The results with *T. tritici* indicated that the recent epiphytotics of bunt on durum wheats were caused by a physiologic form which had not been prevalent until in fairly recent years.

Two physiologic forms of *T. laevis* were identified on the basis of their reaction on the wheat varieties Kota, Ceres, Marquis, and Marquillo. Field observations confirmed experimental evidence that recent outbreaks of bunt in Marquis wheat were due to the presence of a hitherto undescribed physiologic form of *T. laevis*. It was considered that under field conditions *T. laevis* was the predominant species occurring on Marquis and *T. tritici* the predominant species on Mindum and Vernal.

Wheat brown rust, I, II [trans. title], A. Scheibe (*Arb. Biol. Reichsanst. Land u. Forstw., 16 (1928), No. 4, pp. 575–608, pls. 2, figs. 6; 17 (1929), No. 6, pp. 549–586, pl. 1, fig. 1*).—Two studies are here detailed.

I. *Physiological forms (biotypes)*.—Outlining the methods and data in the establishment of physiological forms (biotypes) of the wheat brown rust organism, *Puccinia triticina*, the author concludes that *P. triticina* certainly divides into a number of races. Implications are discussed.

II. *Susceptibility of wheat varieties to brown rust biotypes in different developmental stages of the host.*—The studies above noted have been extended to include varietal susceptibility and biotypic virulence at different stages. The specialization of particular brown rust biotypes, notable throughout the whole developmental course of the host plants of the several varieties, is detailed.

Phoma on Brassica [trans. title], O. Nielsen (*Nord. Jordbrugsforsk., 1929, No. 4–7, pp. 580–587*).—Forms, synonymy, characters, and relations to Brassica are discussed.

The relation of the cabbage maggot and other insects to the spread and development of soft rot of Cruciferae, D. E. Johnson (*Phytopathology, 20 (1930), No. 11, pp. 857–872, fig. 1; abs. in Minnesota Sta. Rpt. 1931, pp. 24, 25*).—A report is given of a study of the bacterial soft rot of cabbage, with special reference to the rôle of the cabbage maggot (*Hylemyia brassicae*) to the dissemination of the organism and the development of the disease.

Development of certain storage and transit diseases of carrot, J. I. Lauritzen (*Jour. Agr. Research [U. S.], 44 (1932), No. 12, pp. 861–912, fig. 1*).—A report is given of studies of Sclerotinia soft rot (*S. sclerotiorum*), Rhizopus soft rot (*R. tritici* and *R. nigricans*), bacterial soft rot (*Bacillus carotovorus*), and Botrytis rot (*B. cinerea*) as affecting carrots in storage and in transit. Notes are also given of several other fungi that appeared to be of minor importance.

The author made a survey of the diseases that normally affect carrots under a variety of storage conditions; determined the losses due to these diseases under different conditions of storage; determined the influence of temperature on the growth of some of the pathogenes in culture media; studied the influence of temperature, wounds, the presence or absence of organic matter, and the method of infection upon the decay of carrots; tested the susceptibility of 18 varieties of carrots to these diseases; and determined the conditions most favorable for the storage of carrots.

No shriveling was found to occur in carrots stored at a temperature of 6.5° C. and at relative humidities of from 90 to 95 per cent, whereas considerable shriveling occurred at relative humidities of 70 and 80 per cent. The environmental conditions regarded as most favorable for the storage of carrots are a temperature of 0° and a relative humidity of from 90 to 95 per cent.

The inheritance of the reaction of maize to Gibberella saubinetii, K. G. McIndoe (*Phytopathology, 21 (1931), No. 6, pp. 615–639, fig. 6; abs. in Minnesota Sta. Rpt. 1931, p. 32*).—An investigation was made of the inheritance of maize under fairly constant environmental conditions in a controlled-temperature greenhouse with soil temperatures at approximately 15° C. The inheritance of reaction to *G. saubinetii* was found to be conditioned by multiple factors. In F_3 lines obtained from parents differing widely in resistance, a definite and significant correlation was found to exist between seedling vigor and resistance, although the relation was not sufficiently constant to warrant selection for resistance on the basis of seedling vigor alone.

Further studies on reaction of corn to smut and effect of smut on yield, F. R. Immer and J. J. Christensen (*Phytopathology, 21 (1931), No. 6, pp. 661–674; abs. in Minnesota Sta. Rpt. 1931, p. 34*).—A study was made to determine the losses caused by smut infection in F_1 crosses and in selfed lines of corn inbred five or more generations. The size and location of the smut galls on the plant were found important. The larger the galls on the stalks, the greater was the reduction in yield of shelled corn. Large or medium-sized smut galls on the stalk above the ears did greater damage than those of similar size below the ears. From the available data it was estimated that the reduction in yield in shelled corn resulting from large, medium, and small galls on stalks was 50, 25, and 10 per cent, respectively. A composite cross was made of 7 low-smut lines and of 1 medium-smut line, and from a study of 299 F_3 lines selected at random, 87 per cent was no more susceptible than the most susceptible parent. The results are said to indicate that composite crosses will undoubtedly yield smut-resistant lines in a large percentage of the cases.

Physiologic specialization and mutation in Phlyctaena linicola Speg., H. A. Rodenhiser (*Phytopathology, 20 (1930), No. 12, pp. 931–942, figs. 4; abs. in Minnesota Sta. Rpt. 1931, p. 25*).—A study was made of several physiologic forms of *P. linicola*, five varieties of flax being inoculated in the greenhouses with four distinct monosporidial lines, but no observable differences were noted in their pathogenicity. In the field, however, differences were noted in the degree of infection caused by Minn. D, a monosporidial line, and Minn. D1, which arose as a sector in a colony of Minn. D. The range of susceptibility to the fungus in a large number of flax varieties and selections was found to be very wide.

The downy mildew of the hop in 1928, E. S. Salmon and W. M. Ware (*Jour. Inst. Brewing, 35 (1929), No. 1, pp. 20–25, pl. 1*).—Since the first appearance in Europe of hop downy mildew, accounts have been given of the spread and increasing injury with further details (E. S. R., 56, p. 847; 57, p.

348; 60, p. 348; 61, p. 537; 62, pp. 49, 532; 64, pp. 230, 231). Following the losses in 1927, occurring even in gardens in which the spiked growths had been removed as recommended, it was recognized that routine spraying was indispensable in England as well as on the Continent. So in 1928 spraying with Bordeaux mixture was instituted on a number of farms in Kent. In the present account a statement is given as to the 1928 incidence of the disease and of the spraying operations as carried out on certain farms.

It is recommended that the removal of spikes and training up of bines be not performed by the same persons, and that reserve bines be trained up. Homemade Bordeaux mixture after adaptation is practical and safe. High pressure and fine nozzles give the desirable misty spray.

Storage rots of the Jerusalem artichoke, H. W. JOHNSON (*Minnesota Sta. Rpt. 1931, p. 40*).—Experiments are reported on the relation of storage conditions to rots of the Jerusalem-artichoke. Storage at a temperature near the freezing point was the only successful method found for preserving the tubers for any considerable time from rotting and shriveling. High temperature and low relative humidity seemed to favor the development of the rots.

Rhizopus nigricans and *Botrytis cinerea* were isolated most frequently from the rotted tubers, although a number of other species of organisms were present. Inoculation experiments were made with a number of rot organisms in addition to those isolated from decaying tubers, and all proved capable of producing rotting of tubers to some extent when held at 20° C. *R. nigricans* and *Sclerotinia sclerotiorum* were the only species capable of causing severe rotting at temperatures within the range in cold storage or in root cellars during the winter months.

The identity of the potato blackleg pathogene, J. G. LEACH (*Phytopathology, 20 (1930), No. 9, pp. 743–751; abs. in Minnesota Sta. Rpt. 1931, p. 21*).—A comparison of the morphologic, physiologic, and parasitic characteristics of cultures of the blackleg pathogene and soft rot bacteria from various vegetables led the author to the conclusion that blackleg is nothing more than soft rot of potatoes, and that the bacteria previously designated as *Bacillus phytophthorus, B. atrosepticus, B. solanisaprus,* and *B. melanogenes* are merely strains of the earlier described species *B. carotovorus.*

Further studies on the seed-corn maggot and bacteria with special reference to potato blackleg, J. G. LEACH (*Phytopathology, 21 (1931), No. 4, pp. 387–406, figs. 14; abs. in Minnesota Sta. Rpt. 1931, p. 30*).—In a previous publication (E. S. R., 53, p. 545) the author pointed out that the seed-corn maggot was an important agent in disseminating the organism that causes blackleg of potatoes. In the present paper the results are given of comparative studies of the internal bacterial flora of the maggot. *Pseudomonas fluorescens* was found present together with other organisms.

Histological studies showed that the bacteria apparently passed uninjured through the intestinal tract of the larvae. In the imago certain types of the microorganisms were apparently destroyed, while other species passed through uninjured. Nutritional studies are said to have indicated that bacteria are not necessary for the growth of the insect, but that they furnish available food by digesting the plant tissues.

Potato black shank and tuber wet rot [trans. title], C. STAPP (*Arb. Biol. Reichsanst. Land u. Forstw., 16 (1928), No. 4, pp. 643–703, pls. 2, fig. 1*).—From potato plants attacked by black stem and from tubers showing wet rot as obtained in various parts of Germany, also in Switzerland, Sweden, and England, the author has isolated a total of 121 bacterial rotting organisms in pure culture. Studies of these and data obtained are outlined or detailed.

The biology of the potato.—II, The pathology of leaf roll [trans. title], F. Merkenschlager and M. Klinkowski (*Arb. Biol. Reichsanst. Land u. Forstw., 17 (1929), No. 4, pp. 345–376, pl. 1, figs. 10*).—This deals with the subjects of leaf roll as an expression of disturbed water balance, the mechanism of leaf roll, leaf roll and other leaf curling phenomena, relations between leaf roll and the developmental stage of the potato plant, leaf roll and soil, leaf roll and climate, and leaf roll as considered historically.

A potato disease [trans. title], G. Pacheco (*Arch. Inst. Biol. [São Paulo], 1 (1928), pp. 69–82, pls. 3; Eng. abs., pp. 79, 80*).—A disease of potato (*Solanum tuberosum*) appearing at Monte Mór, São Paulo, Brazil, is described as causing in a warehouse a dark, soft rot, smelling like salt herring. The bacterium isolated is said to show the characters of *Erwinia solanisapra* more particularly than those of *E. melonis*.

Potato nematodes [trans title], N. A. Kemner (*Nord. Jordbrugsforsk., 1929, No. 4–7, pp. 560–567*).—Information is given regarding the local occurrence, advance, and effects of *Heterodera schachtii*.

The problem of the expansion of the anthracnose of pumpkin [trans. title], M. Rodigin (Rodiguin) (*Zhur. Opytn. Agron. Yugo-Vostoka (Jour. Agr. Sci. S.-E. of U. S. S. R.), 8 (1930), No. 1, pp. 221–226; Eng. abs., p. 226*).—Observations during two years have shown that pumpkin anthracnose is spread by the agency of the insect *Pimelia* sp. and by wind. The disease overwinters on pumpkin residues in the field.

The reactions of rice seedlings to infection of the causal fungus of the "Bakanae" disease and to filtrates of its cultures, F. Seto (*Mem. Col. Agr., Kyoto Imp. Univ., No. 7 (1928), pp. 23–38, pls. 2*).—The rice seedling disease going by the name "Bakanae-byo," occurring commonly and widely on nursery beds in Japan and causing a characteristic overgrowth of the seedlings, is claimed to result from the activity of Fusarium forms isolated from the diseased seedlings and found capable of reproducing the characteristic symptoms. The filtrate of a certain strain of the fungus produced the characteristic symptoms, as did also the filtrate of a Fusarium isolated from the seed. The identifications are not yet complete.

Experimental studies on the pathogenicity of certain fungi on rice seedlings, T. Hemmi and K. Yokogi (*Mem. Col. Agr., Kyoto Imp. Univ., No. 7 (1928), pp. 1–22, pls. 2, fig. 1*).—Results from three series of experiments are said to show that the foot and the root rot of rice can be experimentally caused by a group of fungi. Organisms isolated from the aerial parts, as *Piricularia oryzae, Helminthosporium oryzae* (*Ophiobolus miyabeanus*), *Hypochnus sasakii, H. centrifugus* (*Sclerotium rolfsii*), *S. oryzae-sativae*, and *Sclerotium* sp. can infect rice seedlings under experimental conditions. Under such conditions, causing serious blight of rice seedlings, *Helminthosporium oryzae* (mycelium) penetrates most readily the root tissues and the basal portions. In degree of infection as in intensity of pathogenicity, *P. oryzae* seems to stand next to *H. oryzae*, but to exceed the sclerotial fungi tested.

Mosaic diseases of the sugar beet, edited by V. P. Murav'ev (Muraviov) (*Mozaichnye Bolezni Sakharnoĭ Svekly. Kiev: S. S. U. Soĭuzsakhara (Plant Breeding Dept., Union Sugar Concern), 1930, pp. 286+[1], pls. 22, figs. 29*).—The following contributions are presented:

Mosaic of the sugar beet, P. A. Proĭda (pp. 11–66, Eng. abs. pp. 64–66).—Study (1925 and later) by the phytopathological section of the Kharkov District Agricultural Experiment Station at Kdaes having shown the dangerous character of sugar beet mosaic, this work was extended in 1927 in connection

with the phytopathological organization of the plant breeding and seed growing department of the sugar trust.

It is stated that sugar beet mosaic is coincident with sugar beet culture throughout the districts, though the infection is usually small, reaching its maximum where the first- and second-year cultures territorially converge. The disease is described. Neither production nor loss of leaves is altered by mosaic, though 80 per cent of the young leaves appear infected. The spots tend to disappear during vegetation. From year to year the disease may be transmitted through the roots. Even during the first year insects act as carriers. No resistant varieties are known locally. Sugar reduction due to mosaic may be slight, heavy, or intermediate.

Report on the mosaic-disease of the sugar beet at the phytopathological section of the Kharkov Regional Agricultural Experiment Station for 1928–1929, I. S. Shevchenko (Shevtshenko) (pp. 67–98, Eng. abs. pp. 97, 98).—The above study was continued by the present author in 1928–29.

Sugar beet mosaic is transmitted from the first to the second vegetative period by the roots, which are the main source of infection for other individuals. Weeds also serve as sources of infection. Neither seed nor soil has been found to carry mosaic.

Healthy roots can be infected up to 16 per cent by instruments used both on sick and on sound leaves. Storage of healthy with diseased roots may cause infection in from 2 to 14 per cent. Insect activity is closely related to that of mosaic transmission. Healthy plants can be infected artificially, though difficultly, by the injection of sap expressed from mosaic plants.

In 1928, mosaic was found to have diminished the sugar content by a maximum of 1.1 per cent and on an average of 0.75 per cent in the beets obtained from the seed department of the sugar union.

Mosaic decreased the beet seed output by 12.9 per cent. In the 1928 tests, no variety proved immune. The distance from the main source of infection was found to be a factor. At 770 m a low infection rate was found, and at 1,100 m no infection occurred during the first vegetative period. Surface relief, wind direction, and wind velocity all are factors. No direct methods were effective.

The insects as transmitters of mosaic diseases of the sugar beet, A. I. Novinenko (A. J. Novinenko) (pp. 99–111, Eng. abs. p. 111).—Transmission experiments with mosaic give high rank to *Aphis fabae* and indicate not a simple transmission but also an incubation period. The bug *Poeciloscytus cognatus* was less active. The transmission supposedly does not occur across a distance greater than about 700 m.

Preventive measures considered are the isolation of sugar beet plantings from neighborhoods harboring susceptible weeds and keeping the sugar beet areas free from insects known to transmit sugar beet mosaic.

Materials for studying the mosaic of the sugar beet, V. P. Murav'ev (pp. 113–130, Eng. abs, pp. 128–130).—Sugar beet mosaic appears early on the sugar beet mother (seed) plants, much later on the sugar beets of the first year. With ripeness of the roots there may appear a lessening or an apparent disappearance of the mosaic. The first single mosaic plants noted among beets of the first year were seen late in June. After this they increased. The nearer the sugar beet plantation to the mother plants, the earlier the appearance of mosaic and the stronger its development to the end of the vegetative period. Stable manure diminished the percentage of the mosaic plants more than did mineral manure. Knife transmission was not proved in these ex-

periments. Sugar weight decrease was 0.8 per cent due to mosaic, while root weight decrease averaged 15 g. Earlier infection increases sugar loss and root weight loss.

The requisite distance between the seed plants and the crop belts was 20 m. Mosaic increased the small root weight percentage and decreased the sugar content. At Mironovka no varieties were certainly resistant. Of mother plants from different stations taking part in collective varietal tests, none resisted mosaic infection.

Diagnosis of the mosaic diseases of the sugar beet, V. P. Murav'ev (pp. 131–140, Eng. abs. pp. 138–140).—A decimal system has been adopted for economy of energy and time in expressing the appearances of designated areas descriptively in the case of mosaic plant surfaces.

The mosaic of the leaves of the sugar beet, G. F. Borisevich (Boryssewicz) (pp. 141–160, Eng. abs. pp. 158–160).—Sugar beet leaf mosaic is very common in Podolia (Ukraine), infection ranging from 15 to 100 per cent on mother beets and from 0.5 to 100 per cent on first year beets. Factors affecting mosaic percentages are size of the sugar beet seed plant areas, the source of the trouble; distance and situation of the young plants with regard to air currents; and development of sucking insects acting as carriers.

Types, combinations, growth of shoots and roots, deterioration of sugar content, and control of insects, as also of other wild, susceptible, and potential carriers, are discussed.

Injury which the mosaic produces on the sugar beet, V. I. Shevchenko (Shevtshenko) (pp. 161–166, Eng. abs. p. 166).—Study of injury done by mosaic showed, in 1928, no beet injury due to this cause. Plants showing the most intensive leaf mosaic and plants on which the mosaic appeared first gave the higher root weight and sugar yield. As to sugar percentage, there was no significant difference between the mosaic and nonmosaic plants, though seed yield was somewhat lowered in the plants having mosaic.

The development of mosaic on the sugar beet in relation to the date of sowing, L. M. Shevchenko (Shevtshenko) (pp. 167–176, Eng. abs. pp. 175, 176).—Accounts regarding the mosaic phenomena noted in connection with the two sowings and subsequent croppings of sugar beets, 1927 and 1928, present comparable data. The beets from the later period of sowing were clearly more infected by mosaic. The more infected can be clearly distinguished from the less infected as regards the time of sowing. In 1927 this limit fell between April 23 and May 3 and in 1928 between May 12 and May 23. The inception of mosaic can not be referred to any phase of plant development.

As regards varietal incidence, nothing is yet fully established. In both 1927 and 1928 "Kalnic" showed less infection than the fertile variety "Uladovka," but in 1928 the fertile variety "Ertrag" showed less infection than did Kalnic or "ZZ."

Occurrence of elytrosomes in the leaves of mosaic diseased sugar beet, A. M. Levshin (Lövshin) (pp. 177, 178, Eng. abs. p. 178).—Studies by the author confirmatory of those by Schaffnit and Weber (E. S. R., 61, p. 843) are described as to the presence in the diseased sugar beets of the characteristic small bodies. These "elytrosomes" differ greatly in size. In their earliest stages of development they seem to be homogenous and to have a membrane. The fact that they appear in several but not all parts of the phloem is thought to show that they present an abnormal phenomenon.

General sketch of mosaic diseases of sugar beet, V. P. Murav'ev (pp. 179–262, Eng. trans. pp. 221–261).—This is the author's account in Russian and in English as summarized from the work on sugar beet mosaic and published in the Union of Soviet Socialist Republics and elsewhere.

A number of abstracts of articles on this general subject and a literature list conclude this collection.

Cane diseases in Mauritius: Leaf scald the most widespread (*West India Com. Circ., 46 (1931), No. 853, p. 230*).—Leaf scald (*Bacterium albilineans*), the most important cane disease in Mauritius, is said to be kept in check by a periodic inspection. The disease is widespread on the variety White Tanna, probably due to its being carried in a latent condition, as claimed by D. S. North. Gumming disease, or gummosis (*B. vascularum*), attacks more varieties but is usually limited to leaf infections; though on such susceptible varieties as the Mauritius seedling, 55/1182, serious losses from stem infections occur. Red rot (*Colletotrichum falcatum*) was less prevalent in 1929. Smut (*Ustilago scitamineae*) was almost entirely confined to the lower levels having higher mean temperature. A rapid reddening of the cut stem ends with exudation of a white jelly-like or mucilaginous excretion, with no external symptoms, has been recorded in case of White Tanna and R. P. 8 and is being studied.

A new bacterial disease of sugar cane and suggestions for its prevention (*Sugar News, 12 (1931), No. 5, p. 300*).—It is stated that a bacterial stalk-rotting disease of sugarcane accompanied by fermenting of the juice, not hitherto reported from the Philippines or elsewhere, was found by the personnel of the College of Agriculture at Los Baños in October, 1929, in the cane districts of Laguna and Pampanga. Diseased canes look sickly and unnaturally yellow, and they invariably die. The causal organism, which has been named *Bacillus sacchari*, is most prevalent after a heavy rain followed by cool weather. A few hours of direct exposure to sunlight kills it, so that plowing up and exposing an infected stool or field to sunlight is the safest treatment in either slight or epidemic infection. The article is in English and Spanish.

A new virus disease of Deli tobacco, Rotterdam B-disease [trans. title], S. C. J. Jochems (*Bul. Deli Proefsta. Medan, No. 26 [1928], pp. 3–26, pls. 3, fig. 1; Eng. abs., pp. 24–26*).—A field disease of tobacco, supposedly new (known since 1926), is described under the designation Rotterdam B disease from the Rotterdam B estate in the lower part of Deli. Premature death of the young plants is caused. At least three commercial strains of Deli tobacco are affected. Of other but related plants, only *Nicotiana sylvestris* proved susceptible. The stipple-streak symptoms are suggested in the course of this disease.

Four new host plants of Bacterium solanacearum [trans. title], S. C. J. Jochems (*Bul. Deli Proefsta. Medan, No. 27 [1928], pp. 27–32; Eng. abs., p. 32*).—This paper reports the natural occurrence of *B. solanacearum* in the Deli tobacco district of Sumatra on *Fleurya interrupta, Phytolacca octandra, Sesbania grandiflora*, and *Ruellia tuberosa*.

The use of formalin in controlling the fungus diseases of young tobacco plants in hotbeds [trans. title], N. A. Masalab (Massalab) (*Zap. Gosud. Nikitsk. Opytn. Bot. Sada (Jour. Govt. Bot. Gard., Nikita, Yalta, Crimea), 15 (1930), No. 2, pp. 39–62, figs. 9; Eng. abs., p. 61*).—To protect young hotbed tobacco plants against fungi, formalin was used. Solutions of 1 and 2 per cent gave the most satisfactory results, without, however, controlling weed growths. The variability of results from the use of formalin is attributed to its high volatility, the influence of which could not be entirely corrected by the use of close-fitting glass sash. Formalin solutions of 2 per cent and under do not influence the course of the microbiological processes in the disinfected soil.

Changes in the composition of the tomato plant accompanying different stages of yellows, M. Shapovalov and H. A. Jones (*Plant Physiol., 5 (1930), No. 1, pp. 157–165*).—Chemical changes accompanying development of external symptoms of tomato yellows produced by artificial inoculations with curly top

virus are found to be essentially identical with those which accompany a similar complex of symptoms observed in the field and formerly known under such names as western yellow blight. The present account is detailed.

Soil relations in the region of the lower Elbe and their phytopathological significance in fruit culture [trans. title], H. Wartenberg (*Arb. Biol. Reichsanst. Land u. Forstw., 17 (1929), No. 5, pp. 401–422, figs. 13*).—The data are detailed, with discussion of the questions raised and of the literature as listed.

The effect of sulfur on deciduous trees, L. Smith (*Calif. Dept. Agr. Mo. Bul., 20 (1931), No. 2, pp. 170, 171*).—Sulfur applied to a pear orchard at 30 lbs. per acre produced a blackening of the surface of the shoot tips which proved to be superficial and temporary. The same proved to be true of the fruit, except in the case of quite severe burning, which usually eventuated in a flat-sided fruit with no recovery in case cracking resulted.

Effect of lime sulfur on deciduous fruit trees, T. D. Urbahns (*Calif. Dept. Agr. Mo. Bul., 20 (1931), No. 2, pp. 172–176*).—Lime-sulfur at 32° B., established by the State as a standard and regarded as having no satisfactory substitute, requires for safety in its application consideration of the season (humidity and temperature) and the stage of the tree (as entirely dormant, delayed dormant, coming into bloom, or in leaf). Direct high-pressure spraying against limb ends or into buds increases spraying injury. Weather and atmospheric conditions are discussed in some detail.

Lessons learned on plant disease control, C. E. Scott (*Calif. Dept. Agr. Mo. Bul., 20 (1931), No. 2, pp. 194, 195*).—A brief review is presented of experiences, with particulars on peach blight, peach leaf curl, brown rot of stone fruits, and pear scab.

The migration of Bacillus amylovorus in the tissue of the quince, H. A. Wahl (*Jour. Agr. Research [U. S.], 45 (1932), No. 1, pp. 59–64, pls. 2*).—This is a continuation of the investigations of fire blight made at the Pennsylvania Experiment Station (E. S. R., 58, p. 247).

B. amylovorous was found to migrate through the intercellular spaces of the inner cortex of quince in the form of zoogloeae. During this invasion schizogenous cavities were produced in quince in a manner similar to that reported in the apple. Intracellular invasion of the cortex, involving formation of lysigenous cavities, occurred within 96 hours after inoculation. Death of all the stem tissues occurred within 100 hours after intercellular invasion and within 48 hours after intracellular invasion of the adjacent cortex, although during this time the organism was present only in the cortex.

Biology and control of Pseudopeziza tracheiphila on grape stocks [trans. title], H. Zillig and L. Niemeyer (*Arb. Biol. Reichsanst. Land u. Forstw., 17 (1929), No. 1, pp. 1–66, pls. 4, figs. 4*).—A systematic account is given of the activity of *P. tracheiphila* in grape-producing areas, susceptibility of hosts, behavior of other species of Pseudopeziza, symptoms of the disease, morphology and biology of the fungus, and control measures, with a literature list of 57 titles.

Investigations into "collar-rot" disease of citrus, J. C. F. Hopkins (*Rhodesia Agr. Jour., 26 (1929), No. 2, pp. 137–146, pls. 4*).—Three types of collar rot or mal di gomma of citrus are described, and an account is given of a collar rot due to root disease caused by a Rhizoctonia, which is described, and the parasitic nature of which is discussed in comparison with a Diplodia. Bark decay above the bud union is due to the deposition of gum in the outer woody cylinder, and probably in the cambium. Collar rots from water-logging of the roots and from too deep planting are described. Control measures are proposed for each of the three disease types.

The effect of sulfur on citrus trees, E. A. McGregor (*Calif. Dept. Agr. Mo. Bul., 20 (1931), No. 2, pp. 167–170, figs. 2*).—Sulfur dust, apparently used during 1928 and 1929 mostly against animal pests in the cases cited, caused a certain diminishing amount of injury to citrus fruits, except for an increase after June 20, 1929, associated with heavy rain, resulting humidity, and heat. The recognized sulfur injury was somewhat paralleled by injury ascribed to the excessive heat. Citrus foliage appears to be almost immune to sulfur injury, even when young. Very little sulfur burn occurred during 1930, and it is thought that improved equipment and technic may reduce each year the injury to citrus.

Notes on fungus diseases (*Indian Tea Assoc., Sci. Dept. [Pub.] 1 (1929), pp. 45–53, pls. 7*).—Within 20 years the number of tea disease producing fungi definitely known as such increased from about a dozen to 150, some 80 of these occurring in northeast India. Comparatively few of these, however, caused serious damage. Some diseases, such as black rot (*Corticium invisum*), have been known to cause an 80 per cent loss in a given section.

A brief account of the commoner diseases of the tea leaf includes brown blight (*Glomerella cingulata*), gray blight (*Pestalozzia theae*), copper blight (*Laestadia camelliae*), and blister blight (*Exobasidium vexans*); of the stem, red rust (*Cephaleuros mycoidea*), black rot (*Corticium invisum*), thread blight, die-back (*Nectria cinnabarina*), and brown blight; and of the root, brown rot (*Hymenochaete noxia, Fomes lamaoensis*), charcoal stump rot (*Ustulina zonata*), die-back (*Thyridaria tarda*), black rot (*Rosellinia arcuata*), and violet rot (*Sphaerostilbe repens*).

Studies on a new disease of Celosia cristata caused by Fusarium celosiae n. sp., T. Abe (*Mem. Col. Agr., Kyoto Imp. Univ., No. 7 (1928), pp. 51–64, pls. 2*).—Cockscomb (*Celosia cristata*), cultivated widely in Japan and used commonly around Kyoto as an ornamental, was found to be seriously diseased in the manner indicated in 1924 by T. Hemmi, who is credited with having isolated from the attacked portion a Fusarium. This was studied by the present author who has herein described the attacking organism under the name *F. celosiae*. It attacks leaves, stems, petioles, and inflorescences. In the present paper the morphological as well as the cultural characters of the causal fungus and the results of the inoculation experiments are described.

Elm, maple, and linden verticilliose [trans. title], H. W. Wollenweber (*Arb. Biol. Reichsanst. Land u. Forstw., 17 (1929), No. 3, pp. 273–299, figs. 4*).—This contribution carries forward, with a continuously numbered bibliography, the account given by Wollenweber and Stapp as previously noted (E. S. R., 63, p. 350). The present author reports having found on Ulmus, Acer, Tilia, and very recently Aesculus the same Verticillium, and particulars and discussion are given regarding its characters, identity, and behavior.

Die-back of elm in Minnesota, A. F. Verrall (*Phytopathology, 20 (1930), No. 12, pp. 1004, 1005; abs. in Minnesota Sta. Rpt. 1931, p. 25*).—An elm disease is reported to have been prevalent in nurseries and elsewhere throughout the State in 1928 and 1929. Isolations from diseased trees showed a fungus constantly associated with the disease, and healthy trees inoculated in the field and in the greenhouse reproduced symptoms similar to those on trees from which the organism had been isolated. From the inoculated trees that died, the same organism was reisolated. The causal organism was not definitely determined, but it is said to resemble Cytosporella.

On the occurrence and significance of Oidium leaf disease in Ceylon, R. K. S. Murray (*Ceylon Rubber Research Scheme, Quart. Circ. 2, (1929), pp. 7–22, pl. 1*).—Oidium leaf disease of Hevea, known in Ceylon for only five years, is already deemed a menace to rubber production.

A decay of Sitka spruce timber, caused by Trametes serialis, Fr.: A cultural study of the fungus, K. St. G. Cartwright (*[Gt. Brit.] Dept. Sci. and Indus. Research, Forest Prod. Research Bul. 4 (1930), pp. VI+26, pls. 6, fig. 1*).—Owing to the large percentage of Sitka spruce timber found on arrival from Canada to be unfit for use in aircraft construction, due to defects supposedly attributable to fungi, this investigation was started with a preliminary survey in December, 1925. The progress, development, and results of this work are indicated.

It is stated that *T. serialis* is a prevalent cause of brown pocket rot in Sitka spruce, its action eventuating almost entirely in cellulose destruction. The decay appears to be a very subtle one, discoloration often being observed only in the late stage of the attack. Moreover, hyphae may extend far beyond the discolored areas, this fact rendering inspection largely ineffective. It was found that hyphae may extend the full length of any blocks up to 6 in. long after four months, these blocks showing no visible sign of decay.

Entry is effected usually at the cut ends, though lateral entrance is possible. The hyphae grow in the first instance longitudinally through the tracheids. Reaching spaces having the optimum moisture requirements, the hyphae start to penetrate, probably by means of enzymes secreted at the tips of the actively growing hyphae, which may penetrate through many walls in a straight line at right angles to the length of the tracheids. They may send off branches at intervals, which in turn may penetrate any of the walls, both of the tracheids and of the pits. Brittleness is caused supposedly soon after infection.

Resistance to nematode attack [trans. title], I. Wålstedt (*Nord. Jordbrugsforsk., 1929, No. 4–7, pp. 568–579*).—Both field and laboratory studies are outlined for 1928, as are also some of earlier years, regarding *Heterodera schachtii*, its races and attacks, particularly on beets.

ECONOMIC ZOOLOGY—ENTOMOLOGY

My nature nook, or notes on the natural history of the vicinity of Dunedin, Florida, W. S. Blatchley (*Indianapolis, Ind.: Nature Pub. Co., 1931, pp. 302, pls. 15, fig. 1*).—This account includes numerous references to observations made on the Gulf coast of Florida of the habits of insects, mammals, birds, reptiles, fish, etc., of economic importance in that State.

Feeding habits and forage requirements of Rocky Mountain mule deer in the Sierra Nevada Mountains, C. S. Robinson (*Jour. Forestry, 29 (1931), No. 4, pp. 557–564*).—This is a report of observations of the habits of the Rocky Mountain mule deer in seeking food in the Sierra Nevada Mountains and some of their forage preferences.

The microscopic identification of fur hairs, E. L. Phelps (*Amer. Fur Breeder, 3 (1930), No. 4, p. 20, figs. 3; abs. in Minnesota Sta. Rpt. 1931, p. 17*).—A brief account in which the studies of fur hairs by L. A. Hausman are reviewed (E. S. R., 44, p. 467).

Developments in the control of mice in orchards, G. C. Oderkirk (*Ind. Hort. Soc. Trans., 1930, pp. 112–114*).—Studies in Indiana have indicated that the girdling of the root systems of apple and cherry trees is due largely to pine mice. A poisoned whole oats bait is being used quite extensively by the Indiana fruit growers with good results in the control of meadow and pine mice.

Seeking the smallest feathered creatures, A. Wetmore (*Natl. Geogr. Mag., 62 (1932), No. 1, pp. 64–89, pls. 8, figs. 9*).—This practical account of the bionomics of humming birds, swifts, and goatsuckers, illustrated by paintings from life by A. Brooks, is the first of a comprehensive series of paintings descriptive of all the important families of birds of North America.

The birds of Minnesota, I, II, T. S. Roberts (*Minneapolis: Univ. Minn. Press; London: Humphrey Milford, Oxford Univ. Press, 1932, vols. 1, pp. XXII+691, pls. 50, figs. 303; 2, pp. XV+821, pls. 42, figs. 308*).—In volume 1 of this two-volume work the author first presents a historical and biographical review of ornithology in Minnesota (pp. 1–18). An introduction (pp. 27–135) includes the geography of Minnesota; a synopsis of the bird life of Minnesota; a discussion of conservation of birds in Minnesota, including among other subjects birds in relation to man and mortality among birds, with an account of the animal parasites of birds (pp. 111–114), by W. A. Riley, and infectious diseases of birds (pp. 114–117), by R. G. Green; bird songs and calls; bird banding (pp. 121–127), by F. C. Lincoln; and general comments and explanations. The volume is then devoted to a systematic account of the birds of the State (pp. 137–691), including all but the Passeriformes, or perching birds. Volume 2 in continuing the systematic account deals with the perching birds (pp. 1–455). Keys with descriptions are then given for the identification of the several classes of birds found in Minnesota (pp. 457–731). An abridged bibliography of Minnesota ornithology (pp. 733–792) and a general index (pp. 793–821) are included.

The work is illustrated by 92 colored plates of the birds reproduced from paintings by A. Brooks, G. M. Sutton, W. A. Weber, F. L. Jaques, W. J. Breckenridge, and L. A. Fuertes. The author has found 268 species and 22 additional subspecies to occur regularly in Minnesota, to which should be added 53 species and 7 subspecies that are rare or accidental in occurrence and 6 species that formerly occurred but are no longer found in the State, making a complete list of 327 species and 29 additional subspecies.

The vireos, cuckoos, and shrikes of New Jersey, L. A. Hausman (*New Jersey Stas. Bul. 544 (1932), pp. 32, figs. 28*).—This, the fifth of a series of studies of the native birds of New Jersey (E. S. R., 67, p. 49), calls attention to species not generally well known, although, with the exception of the shrikes, they are common in shady streets and open country. The vireos considered represent 6 species, the cuckoos 2 species, and the shrikes 2 species. A field key is given for the separation of these forms, and charts are given of the dietaries and the foods of the native vireos.

Policies of the Bureau of Biological Survey relative to the control of injurious birds (*U. S. Dept. Agr., Misc. Pub. 145 (1932), pp. 8*).—This publication summarizes the practices to be followed and policies to be observed by field men in the Bureau of Biological Survey in matters of bird control.

The menace of oil pollution, F. C. Lincoln (*Auk., 47 (1930), No. 4, pp. 546–550*).—This account is abridged and summarized from a chapter on oil pollution in the work by Phillips and the author previously noted (E. S. R., 64, p. 453).

On the technique of cestode study, R. A. Wardle (*Parasitology, 24 (1932), No. 2, pp. 241–252, figs. 2*).—Collection and fixation, staining, and reconstruction are considered.

Infection and resistance in the blood-inhabiting protozoa, W. H. Taliaferro (*Science, 75 (1932), No. 1955, pp. 619–629, figs. 4*).—This is a Harvey Lecture delivered before the New York Academy of Medicine in December, 1931.

Cultivation of rickettsia-like microörganisms from certain blood-sucking pupipara, I. J. Kligler and M. Aschner (*Jour. Bact., 22 (1931), No. 2, pp. 103–117, figs. 15*).—The authors report upon experiments dealing with the cultivation of extracellular nonpathogenic rickettsiae from a number of pupipara. Methods are described by means of which cultures of Rickettsia were obtained repeatedly from the parasitic pupipara of the sheep, goat, horse, and

dog. The organisms obtained in culture were minute, Gram-negative, coccoidal rods corresponding to the usual description of Rickettsia and resembling the forms seen in the guts of the insects.

Connecticut State entomologist, thirty-first report, 1931, W. E. Britton (*Connecticut State Sta. Bul. 338 (1932), pp. 495–603+III, pls. 12, figs. 7*).—Administrative and spread control work reported upon includes notes constituting an insect pest survey of the season (pp. 499–516); inspection of nurseries in 1931 (pp. 517–528) and inspection of imported nursery stock (pp. 529, 530), both by Britton and M. P. Zappe; inspection of apiaries in 1931, by Britton (pp. 531–542); gipsy moth control in Connecticut in 1931, by J. T. Ashworth and Britton (pp. 542–553); European corn borer control, 1931, by Britton and Zappe (pp. 553–558); the Japanese beetle in Connecticut in 1931, by Britton and J. P. Johnson (pp. 558–565); and spread of the satin moth and change in the quarantine, by Britton (pp. 565–567).

Work with the oriental fruit moth in 1931, particularly as related to parasites, including *Macrocentrus ancylivorus* and *Trichogramma minutum*, the details being presented in tabular form (pp. 567–572), and notes on the control of the apple leafhoppers in Connecticut, particularly *Typhlocyba pomaria* (pp. 572–577), are presented by P. Garman. It was found that neither lubricating oils, nor tar distillate washes, nor combinations of both afforded control of leafhopper eggs. Lime-sulfur plus nicotine sulfate with iron sulfate added to prevent leaf burn gave the best kill of mature hoppers in midsummer. When late summer treatments are needed, soap and nicotine sulfate will give good results, and if red mites are also present summer oil may be combined with nicotine sulfate for control of both pests at the same time.

Tests of a mineral oil activator for increasing the kill of nicotine sulfate are reported upon by Garman (pp. 578, 579), the details being presented largely in tabular form. In control work with the bean aphid with variable dilutions of nicotine sulfate, ranging from 1–1,000 to 1–4,000 by volume and in a series of experiments in which a comparison is made of nicotine sulfate with and without activator for control of *Macrosiphum solidaginis*, the results in general show slight but not significant differences in toxicity at the different humidities and temperatures. There is said to be little doubt that activators increase the toxicity, although the increase at 1 to 2,000 for *M. solidaginis* did not equal the nicotine sulfate at 1 to 800 dilution. In several cases, the kill at 1 to 4,000 did not equal the kill of nicotine sulfate at 1 to 1,000. In view of these results, dilutions greater than 1 to 2,000 with this activator can not be recommended except in specific instances. The results further indicate that the activator itself accounts for 19 to 25 per cent mortality of the aphids studied.

Mosquito control in Connecticut in 1931 is reported upon by R. C. Botsford (pp. 580–582); an outbreak of the elm leaf beetle (p. 583) and the pickle worm in Connecticut (pp. 584, 585), both by Britton; gladiolus injured by thrips (*Taeniothrips gladioli* Moult. and Stein.), by Britton and B. H. Walden (pp. 585–587); and the use of calomel in the control of root maggot (*Hylemyia brassicae* Bouché) on cabbage, by R. B. Friend (pp. 588–592). It was found that the use of calomel is effective in maggot control on early cabbage and that two treatments are sufficient.

The report concludes with miscellaneous insect notes by Britton and his associates (pp. 593–601), including hibernation of the sycamore lace bug (*Corythucha ciliata* Say), lawns injured by *Ochrosidia villosa* Burm., weevil grub (*Hyperodes porcellus* Say) in lawns, damage by the fruit tree leaf roller, *Bibio albipennis* Say maggots in the soil, gladiolus corms infested by lily aphid (*Myzus circumflexus* Buxt.), abundance of springtails in soil (*Proisotoma*

minuta Tullb.), the painted lady (or thistle butterfly), the pipe vine caterpillar (*Laertias* (*Papilio*) *philenor* L., thrips on privet (*Dendrothrips ornatus* Jablon.), the saddled prominent, status of Asiatic beetle, the greenhouse flower thrips and onion thrips in greenhouses, a new scale insect on beech (*Phenacoccus serratus* Ferris), emergence records of the apple maggot in 1931, the Chinese mantis, gladiolus attacked by tulip aphid (*Anuraphis tulipae*), the European pine shoot moth situation in Connecticut, and notes on the overwintering and refrigeration of *Trichogramma minutum*, including biological facts relating to the identity of the various forms.

A list of publications of the entomological department and a summary of office and inspection work are included.

Insect problems, J. J. Davis (*Ind. Hort. Soc. Trans., 1929, pp. 59–64*).—A discussion of the status of several of the more important insect pests occurring in Indiana.

Insect and other enemies in 1931, R. S. MacDougall (*Highland and Agr. Soc. Scot. Trans., 5. ser., 44 (1932), pp. 130–151, figs. 6*).—This is a report upon the occurrence of and work during the year in Scotland with insect and other enemies in continuation of that previously noted (E. S. R., 65, p. 852).

A simple method of forecasting insect attacks in orchards previous to the spraying season, A. M. Massee (*East Malling [Kent] Research Sta. Ann. Rpt., 19 (1931), pp. 78–80*).—The method here described of forecasting attacks of insect pests has been tried out for several years and proved to be very helpful in suggesting a reliable program for pest control. It consists in obtaining a representative collection of shoots furnished with well developed spurs and forcing early growth by placing them under the influence of heat, etc. The material should be collected from different parts of the orchard, and the spurred growths from trees around the outside of the orchard should first be systematically collected by walking diagonally across the orchard. It is not only essential to select the shoots from different parts of the orchard, but it is equally important to select the material from different parts of the trees, some from spurs situated low down, some as high up as possible, and some from the center of the trees, shoots of 18 in. or 2 ft. in length having proved to be ideal for this purpose. All the shoots should be carefully labelled to denote their position in the orchard. The twigs should then be arranged in glass jars containing sand and water and placed in some warm sheltered spot, such as a greenhouse or on the window ledge of a window facing south. Some few days later the buds will begin to open and many of the parts be forced into growth very rapidly. In addition to the growth being formed some weeks earlier than under natural conditions in the orchard, the insect population on the twigs and shoots also develops correspondingly earlier, and thus it is possible to forecast such attacks as caterpillar, aphid, or sucker some weeks ahead and be prepared to deal with the outbreak at the proper time.

By a similar method it is also possible to forecast when the routine lime-sulfur spraying for the control of the black currant gall mite should be carried out.

The control of the raspberry and loganberry beetle by means of Derris, W. Steer (*East Malling [Kent] Research Sta. Ann. Rpt., 19 (1931), pp. 81–84, fig. 1*).—Experiments conducted in which two applications of a proprietary Derris preparation were made, and are here reported upon, gave very promising results in combating *Byturus tomentosus* Fab.

Temperature and humidity in relation to problems of insect control, A. D. Imms (*Ann. Appl. Biol., 19 (1932), No. 2, pp. 125–143, figs. 2*).—This contribution was presented as a presidential address before the Association of Economic Biologists on February 26, 1932.

Laboratory tests of insecticides (*Ann. Appl. Biol., 19 (1932), No 2, pp. 281–290, figs. 3; 291–294*).—Two contributions are presented, the first on Laboratory Methods for Evaluating Insecticides, by F. Tattersfield, and the second on Laboratory Tests of Insecticides for Use against Wood-Boring Insects, by F. R. Cann.

The insecticidal properties of Tephrosia macropoda Harv. and other tropical plants, F. Tattersfield and C. T. Gimingham (*Ann. Appl. Biol., 19 (1932), No. 2, pp. 253–262*).—The authors present preliminary data on the insecticidal properties of three tropical fish-poison plants, namely, *T. macropoda, Mundulea suberosa*, and *Neorautanenia* (*Rhynchosia*) *fisifolia*. A list is given of other plants, most of them known to be fish poisons, from many different countries which have been tested but appear to have little or no toxicity to the bean aphid. Extracts of the stems of black haiari (*Lonchocarpus* sp.) are shown to be toxic as contact insecticides to young larvae of two species of moths. Older larvae are much more resistant. All the plants so far tested which are toxic both to fish and to insects are members of the natural order Leguminosae.

Some major celery insects in Florida, E. D. Ball, B. L. Boyden, and W. E. Stone (*Florida Sta. Bul. 250 (1932), pp. 22, figs. 10*).—This report of studies conducted by the station and the U. S. D. A. Bureau of Entomology cooperating deals with five of the pests which cause the chief injury to the celery crop in Florida, namely, the greenhouse leaf tyer, celery looper, cutworms (*Noctuidae*), southern army worm (*Xylomyges eridania* Cram.), and the common red spider.

Particular attention is given to the greenhouse leaf tyer (pp. 3–16), its life history as affected by winter temperatures, natural enemies, of which the egg parasite *Trichogramma minutum* Riley is by far the most important, descriptions of its several stages, and suggestions for its control. A study of the weather has shown that an abnormally warm winter temperature is the main factor in causing outbreaks of this pest, and that temperatures within a local producing area may vary enough during the winter season to affect materially the leaf tyer situation. In a normal season egg parasites and birds contribute materially to its control. There are normally four generations of the leaf tyer in the celery in Florida, each larva consuming during its development about 2¼ sq. in. of a celery leaf. The amount of food remains practically constant regardless of the time required for maturity.

The celery looper or the closely related cabbage looper is present on the celery in all sections of the State but rarely in sufficient numbers to be injurious. Cutworms are a factor in all celery-growing areas, but poisoned bran mash applied before planting will largely eliminate them. The southern army worm is present mainly in the fall on small celery and seed beds, but is not a factor during the main celery-growing season. The common red spider, which is a serious pest, especially during dry seasons, can be controlled by timely applications of sulfur and lime.

Black pit of the pecan and some insects causing it, H. S. Adair (*U. S. Dept. Agr. Circ. 234 (1932), pp. 15, figs. 8*).—This is a report of investigations conducted at Brownwood, Tex., during the years 1926 to 1928, inclusive, with a view to determining the cause and to devise means of control of black pit, a condition affecting pecans and causing the shedding of immature nuts. The work has shown it to be produced by either mechanical or insect punctures made in the nuts while they are in the water stage. Insect punctures made in the nuts after the meat of the kernel has formed produce kernel spot. Although injury due to various pecan insects, such as the pecan case bearer, hickory

shuckworm, pecan curculio (*Conotrachelus juglandis* Lec.), and pecan weevil, causes discoloration and subsequent dropping of the nut, this injury is usually identified as insect injury and classified as such. The punctures made by species of stinkbugs and plant bugs feeding on pecans, however, are difficult to locate, and the resulting injury is usually identified and classified as black pit. The species of stinkbugs and plant bugs known to feed on the pecans and cause black pit are *Euschistus euschistoides* Voll., the southern green stinkbug, leaf-footed bug, and *Leptoglossus oppositus* Say.

The species *E. euschistoides* overwinters as an adult. The life cycle during midsummer requires approximately 35 days—5 days as egg and 30 days as a nymph. This insect was found breeding on thistle, basketflower, cowpea, bean, squash, and tomato. In addition to the preferred hosts or breeding plants, the adults feed on a variety of other plants. Two generations occurred at Brownwood during 1928.

The leaf-footed bug also overwinters as an adult. The life cycle requires approximately 54 days—9 days as egg and 45 days as a nymph. This insect was found breeding on the same plants as *E. euschistoides*, and in addition was also observed breeding on peach trees.

The control measure recommended as a means of preventing black pit due to the feeding of stinkbugs and plant bugs consists of the elimination from the vicinity of the pecan orchards of preferred host plants on which these insects breed.

Shade trees threatened by insect pests, E. P. Felt (*Sci. Mo., 35 (1932), No. 1, pp. 59–62*).—A general discussion of the shade tree problem in the northeastern United States, particularly as related to the elm leaf beetle, Japanese beetle, and the European willow leaf beetle.

Chemically combating insect pests of foodstuffs, R. C. Roark (*Indus. and Engin. Chem., 24 (1932), No. 6, pp. 646–648*).—In this practical account presented at the meeting of the American Chemical Society held at New Orleans, La., from March 28 to April 1, 1932, inclusive, attention is called to the fact that "ethylene oxide, ethylene dichloride, and propylene chloride, alone or preferably in admixture with carbon dioxide, are the newest, most effective, and safest materials for fumigating foodstuffs. The pyrethrins are effective contact insecticides and are nonpoisonous to man, but their use is limited by high cost. Rotenone, a compound under experiment, which is 15 times as toxic as nicotine as a contact poison and 30 times as toxic as lead arsenate to certain caterpillars, and which at the same time is harmless to man and domestic animals when taken by mouth, appears to approach the nearest of any known material to the requirements for an ideal insecticide."

Control of thrips on dahlias, C. C. Hamilton (*N. J. Gardens, 2 (1931), No. 1, pp. 19–22, figs. 3*).—A practical account of the control of Thysanoptera on dahlias in New Jersey. The greenhouse thrips is one of the worst offenders, being directly responsible for most of the early injury to dahlias grown from cuttings started in the greenhouse and later set out in the field. The injury is caused by their feeding on the terminal growth before the leaves unfold, resulting in a stunted and somewhat many-branched plant, and later by their feeding on the petals of the bud before the bloom unfolds. Control work includes treatment of cuttings rooted in the greenhouse by spraying, dipping, or dusting with contact insecticides before transplanting. Spraying or dusting should be started soon after the plants are set out or have come through the ground, three or four applications being made at weekly intervals and then at longer intervals.

The red and black cherry aphid in Massachusetts (Homop.: Aphididae), F. W. Miller (*Ent. News, 43 (1932), No. 7, pp. 178–180*).—The red and black cherry aphid (*Aphis feminea* (Hottes)), first recorded as occurring on wild black cherry (*Prunus serotina*) in Maine by Patch in 1914, who ascribed to it the name *A. tuberculata* (E. S. R., 32, p. 848), was observed during the summer of 1930 in the region of Woods Hole, Mass., on *P. serotina*. Descriptions are given of the alate viviparous and apterous viviparous females.

Injury to peach fruits by gipsy-moth larvae, C. E. Hood (*U. S. Dept. Agr. Circ. 235 (1932), pp. 12, figs. 5*).—Observations and experiments conducted in Massachusetts over a period of four years have shown that "considerable gipsy moth injury can occur in peach orchards. The larvae feed readily on the foliage as well as on the fruits of the apple and pear; on the peach, however, they feed only sparingly on the older foliage, but attack the tender stems of the small fruits and cause them to drop, and later feed and gouge out deep holes in the flesh of the larger fruits, making them unfit for market. . . .

"All the experiments conducted and observations made show that in order to prevent serious loss to the peach crop through the gipsy moth it is necessary to spray early in the season, as injury to the stem of the fruit at that time causes it to fall off later. The experiments conducted in 1929 and 1930 showed that good control can be obtained by spraying. Little or no stem injury was noted on the sprayed trees, although the check trees showed considerable injury. . . .

"The experiments have shown that spraying with the following mixture gave good control: Lead arsenate 2 or 3 lbs., hydrated lime 2 or 3 lbs., water 100 gal. The addition of 1 or 1.5 pints of fish oil to the mixture, however, caused it to adhere to the fruit and foliage for a much longer period. More hydrated lime can be added, if it seems necessary, to prevent injury to the foliage by the lead arsenate. In this case more fish oil should be added, since the quantity necessary is determined by allowing 4 oz., or 0.25 pint, of the oil to each pound of lead arsenate and hydrated lime in the spray tank."

The oriental peach moth situation, J. N. Dyer (*Ind. Hort. Soc. Trans., 1930, pp. 126, 127*).—A brief discussion in which particular reference is made to the value of the bait trap as a supplementary control measure.

Studies of bait traps for the oriental fruit moth, W. P. Yetter (*Ind. Hort. Soc. Trans., 1929, pp. 105–110*).—In this report of preliminary work during the summer of 1929 with bait traps for the oriental fruit moth, conducted cooperatively by the U. S. D. A. Bureau of Entomology and the Indiana Experiment Station, the total number of oriental fruit moths caught in aromatic chemical baits from June 27 to September 30 at Vincennes and the captures of oriental fruit moths in boiled peach juice baits with and without sugar, traps with and without screen, from August 23 to September 30 at Vincennes, are given in tabular form. Further work is considered necessary before recommendations regarding these supplementary control measures can be made.

Chrysopids as a factor in the natural control of the oriental fruit moth, W. L. Putman (*Canad. Ent., 64 (1932), No. 6, pp. 121–126*).—In studies at the Dominion Laboratory, Vineland Station, Ont., during the summers of 1930 and 1931 the author found chrysopids to be an important factor in the natural control of the oriental fruit moth, although the actual percentage of eggs and larvae destroyed was not determined. The species responsible are *Chrysopa rufilabris* Burm. and to a lesser extent *C. plorabunda* Fitch. Other species may possibly assist to a limited extent, but *C. oculata* Say is of no importance. The number of chrysopids in the orchards appears to be influenced to a con-

siderable extent by the occurrence on the trees of suitable food for the larvae and to be little influenced by a general scarcity or abundance of aphids.

The European pine shoot moth in red pine plantations, R. B. FRIEND (*Jour. Forestry, 29 (1931), No. 4, pp. 551–556*).—A practical summary of information on the European pine shoot moth, first found in the United States on Long Island in 1914 and since spread to many of the Eastern States and also into Canada. It has seriously injured some of the red pine plantations, and at present it appears to be the most serious potential enemy of red pine in New England.

The more important climbing cutworms, S. E. CRUMB (*Bul. Brooklyn Ent. Soc., 27 (1932), No. 2, pp. 73–98, pls. 2*).—A key to the more important climbing cutworms, 30 in number, is followed by technical descriptions of the cutworms, with records of their distribution and food plants.

Report of the Second International Congress of Malaria, 1930, I, II (*Compte-Rendu du 2. Congrès International du Paludisme, Alger, Constantine, Laveran, 1930. Alger: Sec. Gén. Cong., Inst. Pasteur, 1931, vols. 1, pp. VIII+826, pls. 21, figs. 158; 2 pp. VIII+578, pls. 44, figs. 21*).—Section 2 (pp. 69–307) of volume 1 of the proceedings of this congress, which was held at Alger (Algiers), Constantine, and Laveran in May, 1930, reports contributions relating to the classification and biology of anopheline mosquitoes, particularly *Anopheles maculipennis*, and their relation to malaria.

On the gall midges injurious to the cultivation of willows.—I, The bat willow gall midge (Rhabdophaga terminalis H. Lw.), H. F. BARNES (*Ann. Appl. Biol., 19 (1932), No. 2, pp. 243–252, pls. 2*).—This first contribution deals with the gall midge *R. terminalis*, its morphology, distribution, bionomics, and control.

The present Hessian fly situation, T. H. PARKS (*Ohio Sta. Bimo. Bul. 158 (1932), pp. 168–172, figs. 2*).—This, the annual report of the Hessian fly situation in Ohio (E. S. R., 66, p. 53), is presented in connection with maps which indicate the percentage of wheat straws infested with the Hessian fly in the counties visited just prior to the wheat harvest in 1932 and the Hessian fly-free seeding dates. The wheat insect survey revealed that this pest made a very significant and unexpected increase in numbers during the last year, 35.5 per cent of the wheat straws in the 24 counties visited having been infested with Hessian fly flaxseeds, most of which remained in the stubble, where they will give rise to adult Hessian flies that infest early sowed and volunteer wheat. The summer Hessian fly infestation in 1932 is said to have been surpassed since the wheat insect survey was started in 1918 only in 1920, when the infestation was 44 per cent. There was a substantial increase in fly infestation in 21 of the 24 counties visited.

The nasal bot fly, Cephenomyia auribarbis Meigen (Diptera, Tachinidae), of the red deer, Cervus elaphus L., A. E. CAMERON (*Parasitology, 24 (1932), No. 2, pp. 185–195, figs. 3*).—This is a report of a study of *C. auribarbis*, a bot fly parasite of the red deer, which is distributed throughout the deer forests of Scotland, the adult being on the wing during June and July. The larva normally occurs attached to the walls of the nasal passages and pharynx, where it remains for 10 or 11 months. At maturity it drops to the ground and pupates beneath the surface. The adult females and the early third-stage larva are described and illustrated. A comparison is made between the cephalopharyngeal apparatus of *C. auribarbis*, *C. ovis*, and the horse bot fly. A list is given of 14 references to the literature.

Significant variables in the blowfly environment, R. A. WARDLE (*Ann. Appl. Biol., 17 (1930), No. 3, pp. 554–574, fig. 1; abs. in Minnesota Sta. Rpt.*

1931, pp. 21, 22).—Following general considerations, the author deals with the subject under the headings of the preimaginal environment; material and methods; the incubation, larval, prepupal, and pupal periods, respectively; and the total preimaginal period. The resistance of the environment to the potential abundance of the preimaginal life cycle stages of *Lucilia sericata* was found to be most pronounced in the first larval stage and the prepupal stage. The major significant variables in environment which limit the potential abundance are considered in the order of their importance.

The clinical application of blow-fly larvae, E. F. Roberts (*Sci. Mo., 34 (1932), No. 6, pp. 531–536*).—This summary of information on the use of blow-fly larvae for the treatment of suppurating wounds, particularly chronic osteomyelitis, includes notes on two species of blowflies of the genera Phormia and Lucilia.

The effect of temperature and humidity upon the survival of certain unfed rat fleas, H. S. Leeson (*Parasitology, 24 (1932), No. 2, pp. 196–209, figs. 4*).—In studies in which 2,027 oriental rat fleas, 999 *Xenopsylla astia*, and 646 rat fleas, all unfed and less than 24 hours old, were employed, the following conclusions were reached:

"Duration of life of unfed fleas is not influenced by sex. High temperatures and low humidities tend to shorten life; conversely, low temperatures and high humidities, with a possible optimum of about 90 per cent, tend to produce longer lives. Humidity is at its maximum efficiency in this respect at about 18° C. At 37° humidity ceases to have any effect upon the duration of life of unfed fleas, and the evidence suggests that there is also a low temperature at which humidity has no influence upon survival. There is no direct proportion between survival of unfed fleas and saturation deficiency of the atmosphere at any temperature." Comparing the species, it was found that (1) the rat flea was the longest lived at similar atmospheric conditions, and (2) *X. astia* lived longer than the oriental rat flea at all humidities at 23°.

A list is given of 17 references to the literature.

A simple apparatus for breeding fleas, E. P. Hicks (*Ann. Trop. Med. and Parasitol., 26 (1932), No. 2, pp. 147, 148, fig. 1*).—A description is given of a simple apparatus which the author has devised.

Reactions of the Japanese beetle to spray deposits on foliage, E. R. Van Leeuwen (*U. S. Dept. Agr. Circ. 227 (1932), pp. 19*).—Following a brief introduction and a discussion of the attractive influence of an accumulation of beetles, the author deals at length with the repellency of lead arsenate to beetles, the toxic effects of certain arsenate sprays, the repellent effects of various toxic and nontoxic materials, and the effects of sprayed and unsprayed foliage on the feeding of individual beetles.

It was found that many beetles are repelled before alighting on foliage sprayed with lead arsenate, the number of beetles alighting on such foliage being less than the number alighting on a similar but unsprayed plant. Most of the beetles leave foliage that has been sprayed with lead arsenate or with slaked lime within three hours, some of the beetles on the tree flying or dropping off during the operation of spraying. The highest mortality of beetles which had eaten foliage sprayed with 3 lbs. of lead arsenate, 2 lbs. of wheat flour, and 50 gal. of water occurred among those collected one hour after application of the spray, the range being from 42 to 64.6 per cent. Some of the beetles on the foliage at the time of spraying consume a fatal dose of poison. Certain poisonous sprays are effective for killing beetles during a period of several days.

"A larger percentage of beetles leave trees sprayed with lead arsenate, slaked lime, barytes, copper arsenate, lead arsenate colored green, china clay, basic

lead arsenate, magnesium arsenate, or calcium arsenate than leave similar but unsprayed trees. Chalk was repellent in two experiments and attractive in one experiment made in 1924, and was repellent in one experiment made in 1925. Paris green, which was used only in the 1924 experiments, was slightly attractive. A larger percentage of beetles hover without alighting on trees sprayed with lead arsenate, slaked lime, barytes, chalk, or lead arsenate colored green than about similar but unsprayed trees. A smaller percentage hover without alighting on trees sprayed with Paris green than upon similar but unsprayed trees. Many beetles that come to sprayed or unsprayed foliage leave without feeding."

Control of larvae of the Japanese and the Asiatic beetles in lawns and golf courses, W. E. Fleming and M. R. Osburn (*U. S. Dept. Agr. Circ. 238 (1932), pp. 11, figs. 5*).—The poisoning of turf with lead arsenate to control the larvae of the Japanese beetle, developed at the Japanese Beetle Laboratory (E. S. R., 63, p. 357), has since been found effective in protecting turf from injury by the Asiatic beetle and the Asiatic garden beetle (*Autoserica castanea* Arr.). In this contribution, information is given on the most satisfactory procedures for protecting turf from injury by the larvae of these insects.

Control of the Japanese beetle on fruit and shade trees, E. R. Van Leeuwen (*U. S. Dept. Agr. Circ. 237 (1932), pp. 14, figs. 8*).—This is a practical summary of information based on recent experimental work conducted in the infested area adjacent to the point of original discovery. The measures described are primarily for use in heavily infested areas. Unless serious injury resulted from beetle feeding the preceding year, sprays for the control of this insect are not deemed necessary.

Trapping the Japanese beetle, F. W. Metzger (*U. S. Dept. Agr., Misc. Pub. 147 (1932), pp. 8, figs. 4*).—This is a discussion of the value of traps, followed by general information concerning them and a detailed description of one of the most satisfactory types, including cost of traps, bait to be used, proper placing of traps, and removal of the beetles.

Control of the turpentine borer in the naval stores region, J. A. Beal (*U. S. Dept. Agr. Circ. 226 (1932), pp. 19, figs. 14*).—An account is given of control measures for *Buprestis apricans* Herbst, which attacks principally the faces of longleaf and slash pines that have been exposed by fire or otherwise injured. This pest is undoubtedly the most destructive enemy of turpentine orchards in the South and presents a serious problem in the naval stores region. The heaviest losses resulting from borer damage are due to windfall. Other losses which occur in borer-infested timber are due to lowered grades of lumber and decreased gum production.

"The larvae of this borer tunnel through the sapwood and heartwood of the main trunk of infested trees, and not only render much of the timber worthless, except for fuel, but also weaken the trees so that they break off easily and many of them fall, especially during severe windstorms. The young borers feed for a period of at least three years before constructing their pupal chambers near the surface of the wood, where they transform to the adult or beetle stage. After emerging in the spring, the adults feed on the pine foliage for a few weeks. The beetles mate during the feeding and flight period, after which the females seek exposed wood or checks of any kind in which to deposit their eggs.

"Practically all the damage to turpentine orchards by the turpentine borer can be prevented by the adoption of improved turpentining methods and absolute fire protection for the worked faces. The standard turpentining technic of the U. S. Forest Service offers the maximum protection from borer damage."

The diseases of Elateridae (Coleoptera), C. A. Thomas (*Ent. News, 43 (1932), No. 6, pp. 149–155, fig. 1*).—This contribution from the Pennsylvania Experiment Station is a summary of the present knowledge concerning the few species of bacteria and fungi which have been recorded as having caused injury to the click beetles.

The occurrence of the odd beetle and a brief note on other dermestid species in Canada, C. R. Twinn (*Canad. Ent., 64 (1932), No. 7, pp. 163–165*).—The beetle *Thylodrias contractus* Mots., formerly known as *Ignotus aenigmaticus*, is reported by the author as having been found at Ottawa, Canada, feeding on dried specimens of oestrid flies.

Theory in explanation of the selection of certain trees by the western pine beetle, H. L. Person (*Jour. Forestry, 29 (1931), No. 5, pp. 696–699*).—The studies here reported indicate that an initial weak attraction of the western pine beetle is due to the formation of volatile oils, such as aldehydes or esters, which are by-products of a respiratory fermentation or abnormal enzyme activity in subnormal trees. This attracts beetles from the immediate vicinity, and these in turn introduce a yeast into the inner bark which produces a fermentation strong enough to attract other beetles from a wider radius.

Control work against bark beetles in western forests and an appraisal of its results, F. C. Craighead, J. M. Miller, J. C. Evenden, and E. P. Keen (*Jour. Forestry, 29 (1931), No. 7, pp. 1001–1018*).—This is a discussion of the economics of control work with bark beetles in western forests.

The relation of temperature to the activity and control of the plum curculio in apples, W. D. Whitcomb (*Massachusetts Sta. Bul. 285 (1932), pp. 16, figs. 5*).—In this account, which supplements a report of studies of the biology of the plum curculio in Massachusetts (E. S. R., 61, p. 454), the author deals with the influence of temperature, found earlier in the work to play an important part in the problem of control.

"Studies of the plum curculio at controlled temperatures of 55, 65, 75, and 85° F. indicated that 75° is very near the optimum temperature for the development of the immature stages and the activity of the adults of this insect. At 55° development of the immature stages was not completed, and at 85° development was practically the same as at 75°. Adults feed little and lay few eggs at 55°, but make an average of 6.675 punctures per beetle per day when confined at 75° during the height of their activity. The number of days which plum curculio beetles lived when feeding on poisoned fruit decreased with each increase of 10° in temperature from 55 to 85°, and each increase in the concentration of lead arsenate from 3 to 4 to 5 lbs. in 100 gal. of water. Lead arsenate at the rate of 6 lbs. in 100 gal. of water is apparently repellent to the plum curculio. Five lbs. in 100 gal. of water appears to be the most effective concentration of lead arsenate, although its advantage over 4 lbs. in 100 gal. is small. The addition of fish oil to lead arsenate results in a slight increase in effectiveness, and its use is recommended especially to aid the sticking and spreading of the spray to the fruit and foliage. The addition of lime-sulfur and chemical hydrated lime to lead arsenate-fish oil does not decrease the effectiveness of the combination at high temperatures. The variable temperature in Massachusetts has a noticeable influence on the activity of the plum curculio, and spray applications should be timed according to the temperature. . . .

"The critical period in the control of the plum curculio in apples in Massachusetts occurs during the first warm weather after the blossom petals have fallen when the maximum temperature remains above 75° for two or more days. High temperatures about the time when apple trees are in bloom cause the plum curculio beetles to enter the trees in large numbers. In 1930 the critical period

for control occurred from June 1 to 5, 12 to 14 days after the calyx spray was applied, and records from 29 orchards in Worcester County showed 11 per cent better control on McIntosh and 14 per cent better control on Baldwin where sprays were applied just before or during the early part of the critical period. In 1931 the critical period occurred from May 26 to June 1, 4 to 6 days after the calyx application. In Worcester County timely sprays during the early part of the critical period gave 20 per cent better control on Baldwins and 14 per cent on McIntosh than later applications. Similar results were secured in 30 orchards in Middlesex County.

"In 1931 a timely application of 85–15 sulfur-lead arsenate dust controlled the plum curculio in Gravenstein apples almost as well as a spray of lead arsenate and fish oil, the difference in favor of the spray being 0.89 per cent."

Red-clover pollination by honeybees in Colorado, R. G. Richmond (*Colorado Sta. Bul. 391 (1932), pp. 22, figs. 7*).—Reports current in the Rocky Mountain region, chiefly along the Arkansas River in the vicinity of Rocky Ford, of yields of seed from red clover known to exceed 14 bu. of seed per acre and even 18 bu. from two cuttings per year, led to investigations of the rôle of the honeybee in red clover pollination at various points in the State conducted cooperatively with the U. S. D. A. Bureau of Plant Industry.

The results, the details of which are presented in tabular and chart form, have shown the honeybee to be a carrier of red clover pollen, a large percentage of the bees observed having been active pollinators of red clover. The honeybee was found to be a major factor in the pollination of this plant in Colorado east of the mountains, red clover proving to be a convenient and prolific source of pollen for honeybees in some Colorado localities.

It was found that "honeybees will carry nectar and pollen on the same fielding trip and both in considerable quantities. Insects, capable of penetrating a 13-mesh screen wire, are a minor factor, if an agent at all, in the pollination of red clover at Fort Collins and Rocky Ford. Night-flying insects are not instrumental in red clover pollination at Fort Collins. The length of the corolla tube apparently has no bearing on red clover pollination by honeybees. Alfalfa in bloom does not withdraw the attention of honeybee pollinators from red clover. First-cutting red clover sets a good crop of seed when conditions are such as to be inviting to honeybees. There is a sequence of bloom among the flowers on the head and among the heads on the plant. Corollas of unpollinated flowers remain in flush bloom much longer than those which have been attended by pollinators."

A list is given of 26 references to the literature.

Some attractions of the field study of ants, W. M. Wheeler (*Sci. Mo., 34 (1932), No. 5, pp. 397–402, figs. 2*).—Practical information is furnished on methods and technic in the study of ants.

A tentative synopsis of the hornets and yellow-jackets (Vespinae; Hymenoptera) of America, J. Bequaert (*Ent. Amer., n. ser., 12 (1931), No. 2, pp. 71–138, figs. 6*).—This introduction to the study of the American Vespinae consists of (1) a key to the forms which may be conveniently distinguished by names, (2) a condensed statement of the nomenclature and synonymy, (3) a summary of the distribution based upon the material studied, and (4) a brief account of the ethology, including unpublished observations.

A European sawfly (Diprion polytomum (Hartig)) attacking spruce in the Gaspe Peninsula, Que., R. E. Balch and L. J. Simpson (*Canad. Ent., 64 (1932), No. 7, pp. 162, 163*).—It was found in November, 1930, that spruce stands throughout a great deal of the interior of the Gaspe Peninsula of Quebec had been partially defoliated by a sawfly, determined as the European species *D. polytomum.* In some areas the greater part of the foliage had been eaten,

about 10 cocoons per square foot being found in moss and litter on the ground beneath the trees. An airplane survey made in 1931 showed over 2,000 square miles to be infested. The damage has thus far been confined to the old foliage of white and black spruce. A great deal of white spruce had lost practically all of the old foliage and is in a seriously weakened condition, black spruce being less heavily defoliated. Some 6 per cent of the trees have already been killed by the eastern spruce beetle, which increased considerably in numbers in 1931. There are no previous records of such an outbreak. That this sawfly, described from Europe, should be first discovered in North America in the form of a large outbreak throughout the interior of the Gaspe Peninsula raises the question as to how it was introduced, there being no evidence that it entered the country at any point.

No parasites have as yet been found, and the chief biotic factor of control seems to be the destruction of the cocoons by shrews and mice.

A new nematode, Tylenchus aptini n. sp., parasite of Thysanoptera (Insecta: Aptinothrips rufus Gmelin), U. S. Sharga (*Parasitology, 24 (1932), No. 2, pp. 268–279, figs. 27*).—The author reports upon studies of the morphology and bionomics of a new nematode parasitic on *A. rufus*, first found in December, 1929, and kept under observation in the department of agricultural zoology, University of Edinburgh. In a collection of thrips of this species from 10 localities in the vicinity of Edinburgh, those from 1 locality were found infested. It was found that in the parasitized thrips the ovary as a whole becomes degenerated, the insect being incapable of producing eggs.

Oesophagostomum multifoliatum n. sp., an undescribed nematode from sheep and goats, R. Daubney and J. R. Hudson (*Parasitology, 24 (1932). No. 2, pp. 265–267, figs. 5*).—Under the name *O. multifoliatum* the authors describe a new nematode found in the large intestine of sheep and goats in Kenya Colony.

ANIMAL PRODUCTION

The significance of differences in means in repetition experiments, F. A. Hays (*Poultry Sci., 11 (1932), No. 1, pp. 14–17*).—In this article from the Massachusetts Experiment Station, the author discusses two statistical methods for testing the significance of differences in means of repetition experiments.

An automatic method for collecting solid and liquid excreta from cows in digestion experiments, E. G. Ritzman and N. F. Colovos (*New Hampshire Sta. Tech. Bul. 52 (1932), pp. 16, figs. 5*).—The changes that have been made in this equipment since it was previously described (E. S. R., 61, p. 857) and which have brought about a significant improvement in the degree of recovery of excreta, particularly of nitrogen and of moisture of urine, are described and illustrated. Details of construction and tests to check the accuracy of the apparatus are discussed.

First annual report of the Bureau of Animal Industry, S. Youngberg (*Philippine Bur. Anim. Indus. Ann. Rpt. 1930, pp. 185–332, pls. 6*).—In this report the results of studies with horses, cattle, both beef and dairy, sheep, swine, and poultry are noted.

Handbook on the feeding and nutrition of agricultural animals, IV, edited by E. Mangold (*Handbuch der Ernährung und des Stoffwechsels der Landwirtschaftlichen Nutztiere als Grundlagen der Fütterungslehre. Berlin: Julius Springer, 1932, vol. 4, pp. XVII+930, figs. 210*).—In the fourth volume of this treatise (E. S. R., 66, p. 559), energy changes and the influence of nutrition and metabolism on agricultural animals are discussed.

The chemical constitution of the proteins, R. H. A. Plimmer (*Jour. Dairy Research [London], 3 (1932), No. 2, pp. 186–226*).—This monograph from the

University of London deals with the hydrolysis of proteins and the isolation of the amino acids; the synthesis and constitution of the amino acids; the structure of proteins, polypeptides, and diketopiperazines; and the rôle of proteins in nutrition.

Analyses of commercial feeding stuffs and registrations for 1932, C. S. CATHCART (*New Jersey Stas. Bul. 546 (1932), pp. 84*).—The usual report is given of analyses for protein, fat, and fiber of 1,295 samples of commercial feeding stuffs collected for official inspection during 1931 (E. S. R., 65, p. 857). The principal ingredients in the feed mixtures as determined by microscopic examination are also listed.

Rye as a fattening feed for cattle and swine in South Dakota, J. W. WILSON and T. WRIGHT (*South Dakota Sta. Bul. 271 (1932), pp. 10*).—A basal ration of alfalfa hay and salt was fed to 3 lots of 4 2-year-old steers each for 90 days. In addition the respective lots received ground rye, whole rye, and shelled corn. The average daily gains were 2.6, 2.2, and 3 lbs. per head in the respective lots. The palatability of the rye was not increased by grinding. The steers in lot 1 consumed almost twice as much hay as those in lot 3, while those in lot 2 ate over one-third more hay than the steers in lot 3. The steers receiving rye did not fatten as readily and had not shed their old hair during the fattening period as had those receiving corn.

The average of two experiments to compare rye with corn and barley for fattening spring pigs on rape pasture showed that on a ration of ground rye pigs made average daily gains of 0.9 lb. per head. Pigs receiving shelled corn gained 1.1 lbs. and those on ground barley 1.3 lbs. per head daily. On the basis of feed required per 100 lbs. of gain, the pigs fed rye needed 13 per cent more feed than those fed corn and 1.5 per cent more than those fed barley.

In a third test 4 lots of 8 pigs each, weighing about 105 lbs. per head, were fed in dry lot until they reached an average final weight of 230 lbs. on a basal ration of tankage, alfalfa hay, and a mineral mixture. In addition the respective lots received shelled corn; ground rye; equal parts of ground rye and ground corn; and equal parts of ground rye and ground barley. The average daily gains were 1, 1.1, 1.1, and 1.2 lbs. per head, respectively. It required 126, 116, 116, and 100 days for pigs in the respective lots to reach the final weight. The combination of ground rye and ground barley was the most efficient and economical ration used in this test.

Relative efficiency and profitableness of three grades of feeder steers, II, P. GERLAUGH and C. W. GAY (*Ohio Sta. Bimo. Bul. 158 (1932), pp. 182–185*).—Continuing this study (E. S. R., 66, p. 58), three lots of 12 steers each of choice, medium, and common grade, respectively, were fed a basal ration of 10 lbs. of silage, 3 lbs. of mixed clover and timothy hay, 1.5 lbs. of protein supplement, and a full feed of corn-and-cob meal. The respective lots were fed for 28, 24, and 20 weeks.

The average daily gains were 2.2, 2.4, and 2.3 lbs. per head in the respective lots. The returns per bushel of corn fed, with the pork credited, were 38, 43, and 64 cts. per bushel. There was little difference in the ability of the three grades of animals to make efficient gains, but it is pointed out that the common steers were good dairy-bred steers rather than poor individuals of beef breeds. The season of the year when fat cattle are to be marketed and the place of marketing are deemed important factors in determining the preferable grade of cattle to feed.

Yearling heifers and steers for beef production, E. A. TROWBRIDGE and H. C. MOFFETT (*Missouri Sta. Bul. 314 (1932), pp. 24, figs. 9*).—Concluding this experiment (E. S. R., 66, p. 358), it was found that heifer calves gained less

rapidly and economically but reached market condition quicker than steer calves. When fat heifers and steers were sold at an approximate weight of 725 lbs. there was only a slight difference in selling price, but heifers weighing about 900 lbs. sold for 14.5 per cent less per hundredweight than steers of a similar weight. The lightweight heifers produced carcasses that were as desirable as those from similar steers, but the heavy heifer carcasses were slightly more wasty and had a less desirable conformation than comparable steer carcasses. The results of the experiment led to the conclusion that it was usually more satisfactory from the standpoint of both the producer and consumer to market fat heifers at weights of less than 725 lbs.

A study of range cattle management in Alachua County, Florida, P. D. CAMP (*Florida Sta. Bul. 248 (1932), pp. 28, figs. 7*).—The results are reported of actual range cattle management as used in recent years on four areas typical of the ranges of Florida, namely: Grassy and palmetto flatwoods, prairies or savannas, hardwood hammocks, and blackjack oak ridges. The early history of cattle in this region was secured by interviews with early settlers and their descendants, from county records, and from historical libraries. The management phases were studied in 1931 by contacting 45 owners of herds consisting of 50 head or more, a total of 7,179 cattle, grouped according to the terrain on which they grazed.

The local cattle bear a resemblance to those found in parts of Spain, showing the influence of the original cattle introduced by Spanish settlers. Other breeds have been brought in from time to time for improving the cattle, but early efforts in this respect were not very successful due to the fever tick and lack of proper feeds.

Practical experience shows that 1 acre of prairie range, 4 acres of hammock, 10 acres of flatwoods, or 22 acres of blackjack range are required per animal. Controlled rotation burning of flatwood ranges was generally believed to be advisable under some conditions to control undergrowth and to allow cattle to graze the early native grasses. Burning other types of ranges was not approved because of its damage to the improved shallow-rooted grasses and the forest. Cattle could graze prairie range 9 months of the year but required highland range or supplemental feed during the winter. The elimination of the cattle fever tick and increased knowledge concerning the cause of salt sickness, the nutritive value of the various grasses, and the length of grazing season on them have improved the methods of raising cattle in this area.

The freezing, storage, and transport of New Zealand lamb, E. GRIFFITHS, J. R. VICKERY, and N. E. HOLMES ([*Gt. Brit.*] *Dept. Sci. and Indus. Research, Food Invest., Spec. Rpt. 41 (1932), pp. X+178, [pls. 19], figs. [54].*)—This report includes the results of a scientific survey of the New Zealand frozen lamb industry. Recommendations are made with a view to improving the appearance of the carcasses and to reducing the losses in weight.

Swine management, W. C. SKELLEY (*New Jersey Stas. Circ. 259 (1932), pp. 32, figs. 9*).—A practical publication discussing the selection of breeding stock and the care, sanitation, and feeding of swine under New Jersey conditions.

Cottonseed meal studies, C. H. HUNT (*Ohio Sta. Bimo. Bul. 158 (1932), pp. 178–182*).—In order to check results obtained with pigs (E. S. R., 67, p. 591), rats were used for a biological analysis of cottonseed meal. Diets containing varying amounts of different cottonseed meals were fed to lots made up of 2 male and 2 female rats each.

The results showed that cottonseed meal was deficient in certain amino acids and minerals essential to normal growth. Casein and yeast supplied the missing amino acids as did also tankage and meat scrap. Neither corn nor

alfalfa nor cod-liver oil could entirely overcome the deficiencies of cottonseed meal. Iron oxide was not an efficient mineral supplement. About 84 per cent was the maximum amount of cottonseed meal that could be fed to rats and at the same time include the proper supplements to make the diet complete. A special cottonseed meal gave slightly better growth than regular meal, but reproduction and nursing of young was very irregular and abnormal on all meals tested.

The study revealed that the rat is only about one-fourth as susceptible to cottonseed meal toxicity as the hog.

About 20 per cent of raw crushed cottonseed, properly supplemented, was found to be the maximum that can be fed to rats and obtain good growth.

Horses grown on limited grain rations, E. A. Trowbridge and D. W. Chittenden (*Missouri Sta. Bul. 316 (1932), pp. 19, figs. 4*).—Concluding this study (E. S. R., 66, p. 362), the data show that the liberally grain-fed colts consumed 7,638.2 lbs. of grain, 4,664.8 lbs. of hay, and were on pasture 555 days from birth until they were put to work at about 3 years of age. The limited grain-fed colts ate 4,238.1 lbs. of grain, 5,723.7 lbs. of hay, and were on pasture 573 days during the same period. At the time the animals were put to work the liberally grain-fed colts were over 100 lbs. heavier and noticeably fatter, but the limited grain-fed colts were in a healthy growing condition. There was little difference in the skeletal growth of the two lots.

After being broken and put to work, both groups were handled in the same manner. From the spring they were 3 years old to the spring they were 5, the heavy grain-fed colts lost an average of 13 lbs. per head, while the other colts gained an average of 88 lbs. per head. The average final weights in the respective lots were 1,504 and 1,496 lbs., while the final average height at withers was 65.4 and 64.7 in.

Periodical weights and measurements showed that during the first year of their life colts attained 50 to 60 per cent in weight; 65 to 70 per cent of the total increase in depth and circumference of chest, width at hips, size of fetlocks and coronets; and as much as 90 per cent of the total increase in some important measurements. Only slight development was made by any colt during the fourth and fifth years. The measurements showed a gradual slowing up of growth as age increased, but the increase in weight was slower where limited grain rations were fed. Less difficulty was experienced in keeping colts sound in feet and legs on the limited grain ration, and for farm work horses they were as satisfactory as the liberally fed colts. The latter animals were in more salable condition as yearlings, 2- and 3-year-olds, due to their higher finish.

Photographing birds indoors, A. J. G. Maw (*Poultry Sci., 11 (1932), No. 1, pp. 18, 19, fig. 1*).—A simple apparatus and technic for photographing birds indoors, as developed by the Macdonald College, Canada, is described in this article.

Is the tendency to produce an excess of either sex in the domestic fowl inherited? M. A. Jull (*Poultry Sci., 11 (1932), No. 1, pp. 20–22*).—In an endeavor to determine whether or not the tendency to produce an excess of either sex was inherited, the sex ratio was determined for each family of which each sire and dam was a member and of each family produced by these sires and dams in the White Leghorn and Rhode Island Red breeding pens at the U. S. D. A. Animal Husbandry Experiment Farm, Beltsville, Md., for the years 1927 to 1930, inclusive.

An analysis of the mean chicks' sex ratios of sires and dams, in the case of each breed, showed that the magnitude of these ratios was independent of the magnitude of the mean sire's and the mean dam's sex ratios regardless of the group of sires and dams that were mated together. These results indicate that

the tendency to produce an excess of one or the other sex in the domestic fowl is not inherited.

Protein requirements of chickens, J. S. Carver, J. L. St. John, T. E. Aspinall, and I. H. Flor (*Poultry Sci., 11 (1932), No. 1, pp. 45–57, figs. 3*).—At the Washington College Experiment Station, 3 lots of 65 White Leghorn chicks each were fed for 38 weeks, using 3 different protein levels of dried skim milk. The basal ration contained 12.1 per cent of protein, while in the other lots protein was fed at 15.4 and 18.2 per cent levels, respectively.

The birds on the high-protein level made the most growth during the first 12-weeks period, indicating that a protein level of at least 15 per cent should be fed during this time. During the period from the tenth to the twenty-sixth week, a protein level between 12 and 15 per cent produced more satisfactory and economical growth than higher levels. The pullets in the high-protein lots matured earlier than those in the low-protein lots, but the slower maturing pullets laid the larger eggs. The efficiency of utilization of protein and feed decreased steadily with advancing age. A pathological examination of the birds at the end of the test showed that the high-protein levels had no injurious effects.

Protein requirements of growing chicks, H. I. Milne (*Sci. Agr., 12 (1932), No. 10, pp. 604–620, figs. 5*).—The object of this investigation at the University of Alberta was to determine accurately by metabolism tests the maximum protein retention in growing chicks during the early stages of life. Day-old chicks were fed by the all mash method for periods of 6 weeks.

Preliminary tests were made to determine the highest and lowest proportions of protein supplements which would give normal growth and development. At a level of 5 per cent protein supplement chicks made extremely slow growth but had good health and low mortality, while chicks at an 80 per cent level made slightly better growth but feathered poorly and showed extreme leg weakness and high mortality. Levels of 30 and 55 per cent gave normal growth, with the 30 per cent level being somewhat more efficient in regard to food utilization than the 55 per cent level.

In a second series of tests a standard protein supplement consisting of 50 per cent fish meal, 25 per cent beef scrap, and 25 per cent powdered skim milk was used. A ration containing 40 per cent of this supplement was satisfactory from the standpoint of strength of bone, normal feathering, and general health, and produced more rapid growth, greater uniformity, and more economical gains than rations containing either 20 or 60 per cent levels of supplement. The chicks averaged 441.3 g at 6 weeks on 40 per cent protein, 374.7 g on 20 per cent, and 383.1 g on 60 per cent. An average weight of 417.1 g was obtained in a pen which received 60 per cent protein supplement during the first week and decreased to 10 per cent during the sixth week, while average weights of 445.6 and 407.9 g, respectively, were secured in two pens receiving a ration high in yellow corn plus 25 per cent protein supplement. Mortality was low in this series, except in one pen on 60 per cent supplement, and there were no evidences of rickets or other leg weaknesses. Feather growth was normal except in a few cases of individuals in the high-protein pens.

Protein levels for finishing pullets, A. R. Winter, E. L. Dakan, and A. Bayes (*Poultry Sci., 11 (1932), No. 1, pp. 30–33*).—A series of four trials was undertaken to show whether it is an economical practice to feed rations lower in protein than either the starting or laying rations to pullets between the ages of about 2 and 6 months. In some tests the protein was fed at varying levels.

The results indicated that it is desirable to change pullets from the starting to the laying ration at 8 to 12 weeks of age without using the lower protein

growing ration. Omitting the growing ration resulted in larger and more uniformly developed birds at the time production begins and also in more intense and uniform early production. There was no correlation between the level of protein intake and the age of first egg.

The effect of magnesium carbonate when added to diets of growing chicks, G. D. Buckner, J. H. Martin, and W. M. Insko, jr. (*Poultry Sci., 11 (1932), No. 1, pp. 58–62, figs. 2*).—Continuing this study (E. S. R., 64, p. 374) of the mineral requirements of poultry at the Kentucky Experiment Station, this investigation was undertaken to throw some light on the rôle of magnesium carbonate in the diet of growing chicks. Day-old chicks were divided in 6 lots of 30 each and were fed the same basal ration, to which was added in the respective lots 5 parts each of the following mineral supplements: Tricalcium phosphate; tricalcium phosphate and calcium carbonate; tricalcium phosphate and magnesium carbonate; calcium carbonate; magnesium carbonate; and calcium carbonate and magnesium carbonate. The feed consumption was practically the same in all lots.

The chicks in lot 1 grew as well as or better than any of the other lots, but the addition of calcium carbonate, as in lot 2, caused retarded growth, saw-like edges to the feathers, greater mortality, and a smaller percentage of ash in the dry leg bones. In lot 3 the chicks became nervous and weak, the joints of their legs swelled by the end of the third week, and after 6 weeks all chicks were unable to stand and moved only when disturbed. Their toes turned out, and they walked on the distal end of the tarsometatarsus. The chicks in lot 4 grew approximately the same as did those in lot 1, with the exception of a smaller percentage of ash in the dry bones and a smaller percentage of magnesium oxide in the ash of the bones. The growth and mortality in lot 5 approximated that in lot 1, but the leg bones were deformed and contained less ash and calcium and more phosphorus and magnesium than those in lot 1. In lot 6 growth was less rapid than in lot 1, and there was a smaller percentage of ash in the dry bones. The leg bones were also deformed and contained less calcium oxide and more magnesium oxide in the ash than in the ash of the chicks in lot 1.

These results showed that the addition of magnesium carbonate to the ration of chicks disturbs the calcium and phosphorus balance necessary for normal bone formation.

The effect of ground phosphate rock fed at various levels on the growth of chicks and on egg production, J. G. Halpin and A. R. Lamb (*Poultry Sci., 11 (1932), No. 1, pp. 5–13*).—In a preliminary test at the Wisconsin Experiment Station, growing chicks were fed a basal ration of yellow corn, wheat middlings, dried skim milk, salt, limestone, and steamed bone meal. In the check lot, 3 per cent of bone meal was fed, while in the experimental lots 1, 2, and 3 per cent of a high-grade rock phosphate was substituted for like amounts of bone meal.

In three growth studies there were no harmful effects when rock phosphate was fed at the 1 per cent level. The 2 per cent level showed some depression of growth, and the 3 per cent level was seriously harmful. In 2 5-months egg production tests, the two lower levels of feeding rock phosphate had no definitely harmful effect on number of eggs laid, using the pullets raised on the above rations. The 3 per cent level apparently decreased production. Rock phosphate did not appear to have a measurable effect on the ash content of the tibiae of chicks at from 17 to 20 weeks of age, but there was a marked incidence of crooked breastbones in one test at the 2 and 3 per cent levels.

Some production costs with growing chicks, H. L. Kempster and E. M. Funk (*Missouri Sta. Bul. 313 (1932), pp. 12, figs. 3*).—The data presented in this publication were secured with the chicks of the White Leghorn, Rhode Island Red, and White Plymouth Rock breeds, raised at the station in 1931.

During the first 4 weeks, the average feed consumption per 100 chicks was 84 lbs., ranging from 79 lbs. for the general-purpose breeds to 91 lbs. for the Leghorns. From 4 to 8 weeks the average consumption was 257 lbs. per 100 chicks. Up to 12 weeks 100 chicks consumed a total of 738 lbs. of feed consisting of 621 lbs. of mash and 117 lbs. of grain. At 12 weeks of age pullets weighed on the average 1.6, 1.9, and 1.8 lbs. and cockerels 1.9, 2.1, and 2.2 lbs., respectively, for the Leghorns, Rhode Island Reds, and White Rocks. At 20 weeks of age the average weights were for pullets 2.5, 3.4, and 3.2 lbs. for the respective breeds, while the general-purpose cockerels weighed over 4 lbs. Early-hatched chicks made more satisfactory growth, had a lower mortality, and a larger percentage were retained as layers than late-hatched chicks.

With the exception of Leghorn pullets, it required from 3.4 to 4.1 lbs. of feed to produce 1 lb. of broiler up to 12 weeks of age. Approximately 4 lbs. of feed were required to produce each pound of gain on 4-lb. cockerels of the general-purpose breeds.

Approximately 6 hours of labor per 100 chicks were required for each 4-weeks period. The daily fuel consumption for the various types of hovers used was: Coal, 17 lbs.; oil, 2.5 gal.; and electricity, 3 to 4 kw hours.

Control of cannibalism in chickens, J. S. Carver (*Washington Col. Sta. Bul. 267 (1932), pp. 15, figs. 4*).—The use of natural-colored ruby lights for controlling cannibalism in brooder houses, on pullet range, in battery brooders (E. S. R., 66, p. 661), and in fattening stations is discussed. Painting the windows of houses with a red lacquer or soluble paint was also found to give satisfactory results in the control of this habit.

Types of intensity in Rhode Island Reds, F. A. Hays and R. Sanborn (*Massachusetts Sta. Bul. 286 (1932), pp. 11*).—Continuing this study (E. S. R., 58, p. 766), this phase was concerned with clutch size in periods throughout the year as a measure of intensity. Data are presented to show the correlation between mean winter, mean spring, and mean summer clutch size; the relation of clutch size during these periods to four heritable characteristics affecting fecundity; the mean clutch size during March, April, and May in relation to these heritable traits; and between clutch size during six intervals of time and annual production. All Rhode Island Red pullets hatched during the years 1925 to 1929, inclusive, that appeared to have normal egg records were included in this study.

Winter and spring clutch size showed a nonlinear relation, and the correlation ratio between the two was 0.4171. The same was true of winter and summer clutch size with a correlation ratio of 0.3091. Spring and summer clutch size showed a linear relation to each other and a coefficient of correlation of $+0.4593 \pm 0.013$. Winter clutch size showed a high degree of correlation with age at first egg. The degrees of correlation between winter clutch size and winter pause duration, winter clutch and days broody, and winter clutch and persistency were very moderate but slightly significant. Spring clutch size showed a nonlinear regression to winter pause duration, with a correlation ratio of 0.3596.

The clutch size for the individual months studied was independent of age at first egg, winter pause duration, total days broody, and persistency. Summer clutch size was independent of age at sexual maturity, moderately correlated with winter pause duration and persistency, and had a coefficient of correlation of 0.3531 with total days broody. As indexes of annual egg production, the

short-time measures ranked in the following order: Spring, summer, winter, April, May, and March clutch. Generally the clutch size increased following either the winter pause or a broody period. The mean clutch size for the flock was: Winter, 3.35; spring, 4.07; and summer, 3.04.

No short-time measure of intensity was so accurate as the mean clutch size for the entire year.

The accuracy of periodically weighing a few representative eggs to determine the total monthly and yearly points produced, W. M. GINN (*Poultry Sci., 11 (1932), No. 1, pp. 40–44*).—In order to compare the records made by weighing every egg laid with those made when a representative few were weighed, the Louisiana Experiment Station examined records of the 1929–30 Louisiana egg-laying contest. Every egg laid by 20 pens of the Mediterranean class and 7 pens of the American class had been weighed individually, and the data were compared with results that would have been obtained if only the eggs from each hen laid on the first and fifteenth of each month had been weighed.

The comparisons showed that during the first 5 months of the pullet year the total points produced by pens were generally greater when derived by weighing every egg than when derived by weighing only 2 eggs per month. The opposite was true for the next few months. Based on these results, it was concluded that weighing 2 eggs per month is accurate enough for all practical purposes.

Some factors affecting the weight of egg in domestic fowl, W. R. GRAHAM, JR. (*Sci. Agr., 12 (1932), No. 7, pp. 427–446, fig. 1*).—Data gathered from the records of 913 Barred Plymouth Rock pullets by the Ontario Agricultural College showed that a positive and significant correlation existed between the maximum body weight of the pullets during the 6-months period from February to July, inclusive, and the mean weight of their eggs laid during the same period. The weight of a pullet for any one month was a less reliable index of her egg weight than was the maximum weight. A positive and significant correlation showing a close relation between weight of egg set and weight of the chick hatched from that egg was also found. There were indications that the weight of the egg had little or no effect on its hatchability.

No relationship was established between the feeding of such animal proteins as milk, fish scrap, beef scrap, and tankage and the size of egg produced. Adding cod-liver oil to the ration of laying pullets brought about a slight increase in egg weight during the months of February to July. The addition of cod-liver oil tended to destroy the coefficient of correlation between egg and body weight.

Storage studies of Louisiana eggs, C. W. UPP (*Louisiana Stas. Bul. 229 (1932), pp. 46, fig. 1*).—Concluding this 5-year study (E. S. R., 63, p. 365), in which 19,080 eggs were used, the results appeared to justify the following conclusions:

(1) Louisiana eggs produced according to accepted practices, properly cared for, and marketed while fresh, could be stored for from 6 to 8 months under commercial conditions without excessive shrinkage or excessive percentage of "loss" eggs. (2) No great differences existed in the keeping quality of Louisiana eggs produced as above and mid-west eggs. (3) Cottonseed meal feeding was the predominant cause of olive yolks, but they were not a serious problem when cottonseed meal was avoided. (4) The grade of egg into storage was the largest single factor determining quality at the end of storage, providing the eggs were properly produced.

The loss of weight of duck eggs during incubation, D. H. HORTON (*Poultry Sci., 11 (1932), No. 1, pp. 23–27*).—This study was undertaken to determine the daily loss of weight of ducks' eggs during incubation in three different types

of incubators and under different conditions of moisture. Each lot of eggs was weighed daily at the same time, and on the ninth day the infertile and dead germs were removed. The eggs were tested again on the nineteenth day, and the dead embryos were removed. The eggs were not weighed after the twenty-fifth day.

It was found that in a compartment of the Mammoth type of incubator it was advisable to have as much area of moisture pan as egg tray area. In certain types of incubators it was thought that the moisture pans at one end of the machine might be supplemented with additional pans under the eggs. Electric incubators hatched duck eggs successfully with no more moisture than was supplied by the regular equipment of the machine.

It was evident that duck eggs need more moisture during incubation than hen eggs. During the first 25 days the percentage loss of weight varied from 10.8 to 14.7 in machines giving a hatch over 70 per cent of fertile eggs. The ducklings weighed from 61.2 to 66 per cent of the weight of eggs set.

The marking of ducklings by toe slitting, V. K. TALLENT (*Harper Adams Util. Poultry Jour., 17 (1931–32), No. 6, pp. 257, 258, fig. 1*).—A simple method for marking ducklings for identification by toe slitting, as successfully worked out at the National Institute of Poultry Husbandry, England, is described and illustrated in this article.

The spoilage of dressed ducks by sliminess, W. L. MALLMANN (*Jour. Agr. Research [U. S.], 44 (1932), No. 12, pp. 913–918*).—The cause of a slime formation which develops on squab ducklings, particularly beneath the wings, when shipped moist in containers was studied at the Michigan Experiment Station. Bacteriological examinations were made of slimy ducklings to determine the causative organisms, and methods of control were studied.

The slimy material yielded four microorganisms, the chief of which was a spore-forming capsulated bacillus closely resembling *Bacillus mesentericus*. This organism was found on all utensils and exposed surfaces in the killing and dressing rooms of the duck-packing plants studied. It was possible to induce slime formation by inoculating ducklings with pure cultures of the organism.

The formation of the slime was delayed by adding to the storage tanks 100 parts per million of available chlorine in the form of sodium hypochlorite. Dipping the dressed ducklings in saturated salt brine prevented the formation of the slime.

DAIRY FARMING—DAIRYING

Preparation of feeds for dairy cows, C. C. HAYDEN, C. F. MONROE, and A. E. PERKINS (*Ohio Sta. Bul. 502 (1932), pp. 25, figs. 3*).—The results given in this bulletin are in more detail than information previously reported (E. S. R., 59, p. 267; 61, p. 465; 63, p. 65; and 64, p. 671).

On the basis of the results obtained, it was concluded that grinding good-quality roughage for dairy cattle is not usually profitable and that such finely ground material may be detrimental to the animals. "Predigesting" ground roughages did not prove to be profitable.

The possibility of a home-grown dairy ration, C. F. MONROE and C. C. HAYDEN (*Ohio Sta. Bimo. Bul. 158 (1932), pp. 172–178, fig. 1*).—In this test 2 groups of 6 cows each were used. The check ration consisted of a mixture of corn, oats, bran, and linseed meal 4:3:1:1, while the experimental ration was made up of corn, wheat, and oats 2.5:5:2.5. The lots were fed these rations for 75 days and were then reversed. At the end of the test period 3 cows were continued for an additional 75 days. A third group of cows was fed the home-grown ration for periods ranging from 5 to 7 months.

The results obtained with the first two lots indicated that the rations were approximately equal in feeding value. In the third group the animals apparently maintained a normal state of health with normal production on the home-grown ration. The butter made from cream produced by cows on the ration containing wheat was somewhat inferior to that of cows on the check ration. Swiss cheese made from the milk of cows receiving wheat was of good quality.

This test demonstrates the possibilities of an entirely home-grown ration, particularly when a good quality of legume hay was fed.

The control of pastures on some farms in Finland (Suomi) in 1929 and 1930 [trans. title], C. A. G. CHARPENTIER ([*Finland*] *Valtion Maatalouskoetoiminnan Julkaisu, Nos. 34 (1930), pp. 118, Swed. and Eng. abs., pp. 81–92; 41 (1931), pp. 107, figs. 8, Swed. and Eng. abs., pp. 77–88*).—Over a period of 5 years dairy cattle on a forest pasture in Finland obtained little more than a maintenance ration. On cultivated wooded pastures milk production per hectare was low, chiefly because they were grazed by young cattle, but there was a material increase in weight. On arable pastures both milk production and weight increase were considerably better than for the other types of pasture.

Pasture periods averaged about 100 days, over which about one-third was on fields grazed after haymaking. Spring-calving and winter-calving cows gained from 200 to 300 g per day, autumn-calving cows 400 to 500, pregnant heifers about 500, 1- to 2-year-old heifers 300 to 400, and calves 400 to 500 g per day.

Spring-calving cows produced from 8.9 to 13.2 kg of milk per day, autumn-calving cows 1.7 to 5.9, and winter-calving cows 5.7 to 10.1 kg per day. The fodder consumption in fodder units per day was for spring-calving cows 7.1 to 9.3, autumn-calving cows 5.4 to 8, winter-calving cows 6 to 7.9, pregnant heifers 3.7 to 6.3, 1- to 2-year-old heifers 2.8 to 4.6, and calves 2.1 to 3.1. The cost per fodder unit of pasture was lower on cultivated wooded pastures than on arable pastures, due to the lower cost of fertilizing and the lower price of land.

The results obtained in 1930 were essentially the same as those for the previous year.

The behavior of cows on alfalfa hay as the sole roughage and on alfalfa and timothy combined, E. B. MEIGS and H. T. CONVERSE (*Jour. Dairy Sci., 15 (1932), No. 2, pp. 171–184*).—A study by the U. S. D. A. Bureau of Dairy Industry in an effort to determine methods of feeding and treatment for dairy cows which could be easily controlled experimentally and which would keep cows for an indefinitely long period in good health and at or near optimum milk-producing and reproductive capacity has progressed far enough for a partial account of the results.

It has been found that when cows are fed grain with either timothy or alfalfa hay as the sole roughage they are likely to consume small quantities of roughage, and to have periods of digestive disturbances and lack of appetite during which they show a decided distaste for the kind of hay they have been eating. Feeding the other kind of hay under such conditions was usually followed by fairly rapid recovery. Feeding high quality alfalfa and timothy hay in such a manner that the cows could consume as much of each as they wished resulted in a larger consumption of hay and in a higher milk production than when alfalfa was fed as the sole roughage.

The comparative value of cottonseed hulls and hay as roughages for growing dairy heifers, O. C. COPELAND (*Texas Sta. Bul. 451 (1932), pp. 16, figs. 9*).—In this study, covering a period of 4.5 years, dairy heifers were divided into two groups of 23 animals each, one of which received only cottonseed hulls for dry roughage, while in the other lot Bermuda grass was fed during

the first year of the test and Sudan and sorghum hays thereafter. Body weight and 10 body measurements were taken at 3-month intervals to measure growth.

The heifers fed hay averaged 50 lbs. heavier at 21 months of age than the heifers fed hulls. There were significant differences in body measurements in favor of the group fed hay, except in the case of height at withers, paunch girth, and cannon circumference. In the hay-fed group the most rapid growth was made during the first 18 months, especially from 6 to 9 months of age. The group receiving hulls made slightly greater gains from 18 to 27 months of age, indicating that the growth period of this lot was prolonged.

The difference in growth could be attributed to the difference in the amount of productive energy of the hulls and the hay, because other feeds and treatment of the groups were identical. Where heifers were allowed access to pasture for more than 6 months of the year, the use of cottonseed hulls as a dry roughage did not impair the breeding performance of the animals.

The feeding value of dried apple pomace for dairy cows, J. C. KNOTT, R. E. HODGSON, and E. V. ELLINGTON (*Washington Col. Sta. Bul. 270 (1932), pp. 19, figs. 3*).—Continuing this study (E. S. R., 66, p. 768), feeding tests were conducted at the main station at Pullman and at the Western Washington Station and a digestion trial was carried out at the main station. A group of 3 cows fed solely on apple pomace through a 12-day preliminary and a 14-day collection period was used in the digestion trial. In each of the feeding tests 2 lots of 5 cows each were fed by the double reversal method with preliminary periods of 1 week and periods of comparison of 4 weeks' duration. Dried apple pomace was fed to one lot and dried beet pulp to the other. Aside from this difference the feeding and management were the same.

The total digestible nutrient content of dried apple pomace was 71.58 per cent. The coefficients of apparent digestibility were high for all the various constituents except protein, and this failure was attributed to the low protein content of the pomace. The percentage digestibility of the dry matter was 72. The results of the digestion test showed that dried apple pomace furnishes a palatable feed of only slightly less value than dried beet pulp.

When soaked for from 2 to 12 hours in 2.5 times its own weight in water, apple pomace was a valuable source of succulence and could be fed at the rate of 3 lbs. of soaked pomace per 100 lbs. of live weight. The dried apple pomace could also be fed as a part of the grain mixture, replacing some of the carbonaceous concentrates. Milk production was approximately 6.5 per cent less on dried apple pomace than on dried beet pulp. The apple pomace did not affect the flavor or odor of the milk.

Raising dairy calves with dried skimmilk, J. C. KNOTT, R. E. HODGSON, and E. V. ELLINGTON (*Washington Col. Sta. Bul. 273 (1932), pp. 20, figs. 10*).—Continuing this experiment (E. S. R., 66, p. 769), results are reported on 31 heifer calves dropped in the herds at the main station and at the Western Washington Station. All calves had access to water and good alfalfa hay at all times and in addition received a dry calf meal containing 25 per cent of powdered skim milk.

The heifers were normal in size at 6 months of age. The 23 Holstein heifers from birth to 6 months of age consumed an average of 140.3 lbs. of whole milk, 189.7 lbs. of remade skim milk, 530.4 lbs. of grain mixture, and 579.5 lbs. of hay. The average feed cost for this ration was $20.02. The heifers made average daily gains of 1.4 lbs. per head at a cost of 7.76 cts. per pound of gain.

A grain mixture containing 10 per cent of blood meal gave slightly better results than one containing 5 per cent. Heifers raised in this manner were thrifty and vigorous at 6 months of age and could not be distinguished from

heifers raised on skim milk. The system can be successfully used where liquid skim milk is not available and in regions where whole milk is sold. It also reduces the labor required for raising calves.

A feeding schedule for raising calves on a dry-fed calf mixture containing dried skim milk is recommended.

The influence of certain balanced rations on the chemical and physical properties of milk fat, O. R. Overman and O. F. Garrett (*Jour. Agr. Research [U. S.], 45 (1932), No. 1, pp. 51–58*).—At the Illinois Experiment Station three groups of cows producing about 200 lbs. of milk daily were fed special grain mixtures made up so that about 50 per cent of the total protein of the mixture was supplied by a high protein feed. These feeds in the respective lots were cottonseed meal, linseed meal, and ground soybeans. The mixtures were otherwise the same, except for a small difference in percentage of corn. The mixtures were fed at the rate of 1 lb. to 3 lbs. of milk produced. Corn silage and alfalfa hay were liberally fed, but the animals had no access to pasture. On certain days during the experimental period the milk from each group was separated with a centrifugal separator, the cream churned, and the butter subjected to laboratory examinations.

The milk fats produced during the feeding of the soybean ration showed on the average a higher index of refraction and iodine number, slightly higher mean molecular weight, and lower saponification and Polenske numbers than those produced during the feeding of the other grain mixtures. The differences between the fats produced during this study did not appear to be large enough to be of other than scientific interest.

The fat percentage of milk as affected by feeding milk to dairy cows, N. N. Allen (*Jour. Dairy Sci., 15 (1932), No. 2, pp. 132–141, figs. 2*).—In this study at the Minnesota Experiment Station, 11 cows in various stages of lactation were divided into two lots and were fed through three 6-day periods. One lot received the regular ration moistened with whole milk and molasses, while the other lot received the ration moistened with water and molasses. Milk was fed at the rate of 2 lbs. for each pound of grain. In other periods part of the cows from each group were given their ration moistened with skim milk and molasses, while the remaining cows had their ration moistened with 40 per cent of cream diluted with water and molasses. The average daily fat percentage of the milk of each cow was determined by the Babcock method on samples prepared by taking an aliquot part from both morning and evening milk.

When whole milk was added to the ration of dairy cows, a marked increase in butterfat percentage and production occurred. This effect first became noticeable about 24 hours after the milk was added and remained for about the same period after it was discontinued. Similar results were obtained when cream was fed. Skim milk did not affect either butterfat production or percentage. The increase due to milk feeding could be maintained for at least 12 days.

Definite conclusions could not be drawn from these results, since the response was not uniform and the immediate effect upon milk production was not significant. The increase in butterfat production was not efficient, since it accounted for less than 20 per cent of the butterfat consumed. No unfavorable physiological effects were observed, but milk was not readily consumed by cows not accustomed to it.

A study of the gestation period of Holstein-Friesian cows, J. C. Knott (*Jour. Dairy Sci., 15 (1932), No. 2, pp. 87–98, fig. 1*).—In order to determine, in so far as possible with available material, the average length of the normal gestation period of Holstein-Friesian cows, the variations that occur, and the

cause for such variations, the Washington College Experiment Station obtained data on 2,910 gestation periods of cows located in three herds.

The average number of days of 2,824 gestation periods that ended in single births was 279.9±0.063, and for 86 gestation periods that terminated when twins were dropped 275.5 days. The periods varied in length from 262 to 296 days, but about 75 per cent of all calves were dropped between the two-hundred-and-seventy-fifth and two-hundred-and-eighty-fifth days, inclusive. Only 1.7 per cent were dropped before the two-hundred-and-seventieth day and 2.7 per cent after 290 days. On the average, male calves were carried one day longer than females.

As the cows increased in age from 2 to 6 years an increase in the length of gestation period of about 1.5 days was observed, but after the sixth year there was a tendency for the periods to shorten somewhat.

The gestation periods of calves sired by some bulls were definitely shorter or longer than the average. For 29 cows that had produced 6 or more calves each, the shortest variation was 6 days and the longest 20 days from the average length of gestation. Some cows were quite uniform in this respect, while others varied widely. Eleven exceptionally high-producing cows were carried in dam about 1.5 days longer than the average for all females. Four of the above calves showed a marked tendency to have gestation periods similar in length to that of their dams.

The chemistry of the blood of dairy cows before and after parturition and its relation to milk fever, L. T. Wilson and E. B. Hart (*Jour. Dairy Sci., 15 (1932), No. 2, pp. 116–131*).—In an effort to determine whether the disturbances that bring on milk fever are present in all parturitions and only show their effect when they become acute, or whether milk fever is caused by a peculiar or unusual disturbance, the Wisconsin Experiment Station analyzed blood samples taken before and after calving from cows in the station herd. The samples were taken from the jugular vein and were analyzed for total serum calcium, inorganic serum phosphorus, total sugar, and in some cases for nonfermentable reducing substance.

The blood protein values obtained when milk fever occurred were comparable to those for normal calvings, indicating that anhydremia is not an important factor in milk fever. A tendency for the inorganic calcium of the blood of most cows to fall slightly within the first three days after calving was most marked in cows that had been through a lactation period. A similar but less consistent tendency was noted for the inorganic phosphorus of the blood. Additional evidence was found to show that a calcium deficiency was the essential factor in milk fever. The plasma phosphatase tended to be fairly high three weeks or more before calving, then fell until near the time of calving, when it tended to rise again. During the three weeks after calving it usually declined again. The phosphatase activity of the milk was usually higher than that of the plasma of the cows, and was much greater in the milk of cows at the end of lactation than in high-producing cows at the beginning of lactation.

Influences of heating and agitating milk before separation on the fat loss in the skim milk, J. Lyons and W. Finlay (*Roy. Dublin Soc. Econ. Proc., 2 (1932), No. 27, pp. 423–443, fig. 1*).—Studies were undertaken at the Institute of Dairy Science, University College, Cork, to determine whether it would be practicable to eliminate the heating of milk before separation without adding to the fat loss in the skim milk.

It was found that the time and temperature at which milk samples were whirled in a Gerber centrifuge were important factors in the results obtained. When Gerber tests were whirled for four periods of 5 minutes each, heated to

from 175 to 180° F. in the intervals, and read at 149°, the results agreed closely with those obtained by the Roese-Gottlieb method. Agitation adversely affected the skimming loss in both heated and unheated milks, but was more pronounced in the unheated milk. Heating cold milk to a temperature below the melting point of fat did not improve skimming efficiency materially. In both heated and unheated milks, the fat loss increased as the lactation period advanced, as did also the difference in fat loss due to heating. On the basis of these results, it was concluded that heating milk in Irish plants with small supplies and with the type of heater generally used was a doubtful practice.

Control of spreaders in milk plates, J. Broadhurst and E. Krug (*Jour. Dairy Sci., 15 (1932), No. 2, pp. 142–146, figs. 3*).—In a preliminary test a batch of 1.5 per cent agar was tubed and divided into five parts, which were subjected, respectively, to various rates of drying for one week. When inoculated with spreaders and plated, the driest agar gave most definite evidence of the inhibition of the spreading tendency.

On this basis agar was prepared with a range in the relative agar-water content of 1.5, 2, and 3 per cent. Each mixture was melted in an autoclave, filtered, tubed, and sterilized for 30 minutes at 15 lbs. pressure. The agars were then plated with one or more of a series of 12 different spreading organisms. Raw, pasteurized, and sterile milks were used, and each lot of milk was inoculated with 1 c c of a milk dilution of one or more spreaders.

The 3 per cent agar caused a marked reduction in the spreaders, but the 2 per cent concentration did not reduce spreaders enough to recommend its adoption. The 3 per cent agar concentration did not markedly or uniformly reduce the total bacterial count, nor did it interfere with the development of pin-point colonies.

The effect of pasteurization on the bacterial flora of low count milk, L. A. Black, C. C. Prouty, and R. A. Graham (*Jour. Dairy Sci., 15 (1932), No. 2, pp. 99–112, figs. 7*).—This experiment at the Washington College Experiment Station was designed to give information on the types of bacteria surviving pasteurization of low-count milk, changes occurring in the developing flora subsequent to pasteurization, and the relation of the flora to changes taking place in the milk. Samples of morning milk were divided into equal portions, one of which was pasteurized in a flask at 142.5°±0.5° F. for 30 minutes. Samples from both the raw and pasteurized milk were incubated at temperatures of 68 and 45°, respectively, and were examined daily for off flavor until the milk was unfit for consumption.

The average plate count on the 20 samples of milk before pasteurization was 3,467 per cubic centimeter and after pasteurization 377 per cubic centimeter. In raw milk the acid-producing bacteria made up 26.17 per cent, the proteolytic 0.76 per cent, and the alkali-forming and inert 73.07 per cent of the bacterial flora present. The percentage of these types in freshly pasteurized milk was 14.64, 0.62, and 84.74, respectively. In raw milk incubated at 68° the acid group increased to 68.69 per cent, the proteolytic group decreased to 0.038 per cent, and the alkali-forming and inert group decreased to 31.25. For raw milk incubated at 45° these percentages were 62.15, 11.29, and 25.56. In pasteurized milk incubated at 68° the acid producers increased to 22.51 per cent, the proteolytic group to 23.74, and the alkali-forming and inert group decreased to 53.76 per cent. For pasteurized milk incubated at 45° the percentages were 11.38, 13.85, and 74.77. Cooledge score and titratable acid determinations furnished additional information relative to the groups of organisms responsible for the changes occurring.

These results indicate that when milk of low initial count was pasteurized the acid-producing bacteria were not of major importance in the spoilage of the milk. It seemed likely that the trouble could be attributed to the action of the proteolytic and alkali-forming and inert bacteria, particularly when contamination subsequent to pasteurization was eliminated.

Construction and arrangement of city milk plants, C. E. Clement, J. B. Bain, and F. M. Grant (*U. S. Dept. Agr. Circ. 228 (1932), pp. 40, figs. 22*).—This is a revision and supersedes Bulletin 849 (E. S. R., 43, p. 682).

Grading cream for buttermaking, H. A. Bendixen and E. V. Ellington (*Washington Col. Sta. Bul. 269 (1932), pp. 31*).—Tests indicated that up to the present time, because of the complexity of factors affecting flavor in butter and cream (E. S. R., 66, p. 769), no absolutely reliable cream-grading system has been devised. Personal preferences and the inaccuracy of the generally poorly developed human senses of taste and smell make grading difficult, while in addition certain off flavors in cream disappear during processing and certain others persist. A combination of flavor and acidity appears to be the most dependable means of grading yet devised, and on this basis four grades for cream, special, first, second, and unlawful and rejected, are suggested.

A technic for cream grading dealing with sanitation, flavor and acid determinations, and age of cream is suggested. The necessity of a price differential for stimulating the extra effort needed to produce high-grade cream is discussed.

Some factors influencing the capacity of the atmospheric drum drier, W. B. Combs and E. F. Hubbard (*Jour. Dairy Sci., 15 (1932), No. 2, pp. 147–154*).—The Minnesota Experiment Station made a study of a number of possible factors influencing the capacity of an atmospheric double-drum drier. A standardized method of procedure was developed for the operation of the drier, which under normal operation had a capacity of from 58 to 60 lbs. per hour.

Drying milk at from 50 to 60° F. decreased the capacity of the machine 8 per cent, while preheating skim milk to 185° increased the capacity 18 per cent. When a low level of skim milk was maintained over the drums the capacity was reduced to 32 lbs. of dried skim milk per hour, while when a high level was used there was a yield of 72 lbs. When the speed of the drum was increased to 36 r. p. m. and the steam pressure to 85 lbs., the capacity of the machine was 85 lbs. per hour. While increasing the speed and steam pressure increased the capacity of the machine, regardless of the temperature of the milk when applied to the drums, the greatest capacity was secured with milk at 185°, using the speed and steam pressure above mentioned.

Applying concentrated skim milk containing 30 per cent solids at 40° to the drums operated at 34 r. p. m. resulted in a capacity of 70.2 lbs. per hour. Reducing the speed to 20 r. p. m. and increasing the temperature of the milk to 180° increased the capacity to 73.2 lbs. per hour, while increasing the speed to 36 r. p. m. and applying concentrated milk at 180° resulted in a capacity of 130 lbs. per hour. With milk of uniform freshness it was evident that variance in the capacity of the drier had no effect on the amount of dispersion of dry milk when reconstituted with water.

The food value of frozen evaporated milk, E. A. Louder and L. S. Smith (*Jour. Dairy Sci., 15 (1932) No. 2, pp. 113–115*).—In this test the growth of rats over a 12-weeks period was observed to determine the effect of freezing evaporated milk on its food value. One lot of rats was fed an exclusive diet of evaporated milk that had been stored under normal conditions, while the other lot received evaporated milk that had been stored for 5 months 20 days at —5° F., followed by 30 days' storage at normal temperatures.

The rats in lot 1 made average gains of 57.1 g on an average daily food intake of 32.1 g (in terms of ordinary milk). In lot 2 the rats gained an aver-

age of 58.2 g on an average of 33 g of milk per day. It was concluded that freezing did not destroy any of the food value of milk, nor did it produce any substances that were injurious to health.

VETERINARY MEDICINE

Annual reports of the Civil Veterinary Department, Bengal, and Bengal Veterinary College for the year 1930–31 (*Civ. Vet. Dept., Bengal, and Bengal Vet. Col. Ann. Rpts. 1930–31, pp. 65+2, figs. 5*).—The annual report of the Civil Veterinary Department, Bengal, by S. S. Ahmed (pp. 1–31) includes an account of the treatment of diseases through preventive inoculation and tables showing the mortality resulting from contagious diseases during the year, the results of preventive inoculations, etc. The report of the veterinary college, by A. D. MacGregor (pp. 35–56), includes a discussion of the department of epizootic diseases of animals in Calcutta. In the several appendixes (pp. 57–62) are charts showing the incidence of rabies during 1929–30 and 1930–31, the consumption of antirinderpest serum during 1929–30 and 1930–31, the monthly incidence of protective inoculations in severe rinderpest outbreaks per district for 1930–31, the consumption of antihemorrhagic septicemia serum during 1929–30 and 1930–31, and the incidence of cattle mortality from rinderpest and hemorrhagic septicemia in Bengal, and a table giving the expenditure of sera and vaccines in each district during the year 1930–31.

Blood grouping in man and animals, with special reference to its occurrence in the equine, J. Anderson (*Vet. Rec., 12 (1932), No. 25, pp. 691–698*).—The author briefly reviews the salient features of blood group work in men and deals with the literature on isoagglutination reactions in animals, a list of 38 references to which is included. His blood group investigations in equines reported upon are summarized as follows:

"In an examination of 61 horses of a heavy breed, four blood groups could be differentiated: Group O, 24.59 per cent; group A, 31.15 per cent; group B, 37.7 per cent; and group AB, 6.56 per cent. 86.88 per cent of animals were grouped in this way; the remainder fell into accessory groups. A number of horse bloods contained neither agglutinogen nor agglutinin. It is concluded that the horse, as regards the specificity and occurrence of blood group reactions, is less highly developed than man, due, probably, to variation in the activity of agglutinins and in the combining power of agglutinogens."

The possibility of using blood group reactions as a means of differentiating breeds of animals is discussed briefly.

Technic for the isolation of streptococci, W. J. Stainsby and E. E. Nicholls (*Jour. Lab. and Clin. Med., 17 (1932), No. 6, pp. 530–538*).—The author here discusses the bacteriological procedures essential to the successful cultivation of streptococci in connection with a list of 49 references to the literature.

Diagnosis of hepatic distomatosis by allergic reaction [trans. title], H. K. Sievers and R. Oyarzun (*Compt. Rend. Soc. Biol. [Paris], 110 (1932), No. 22, pp. 630–632*).—The authors find the reaction obtained by use of an extract of the liver fluke (*Fasciola hepatica*) to constitute a simple and reliable method of diagnosing hepatic distomatosis, the reaction being specific.

Studies of the liver fluke (Fasciola hepatica), J. N. Shaw (*Jour. Amer. Vet. Med. Assoc., 81 (1932), No. 1, pp. 76–82, figs. 2*).—In further observations (E. S. R., 63, p. 673) at the Oregon Experiment Station cercariae from artificially infested snails were discharged 4 months and 27 days after infestation. "Cercariae were shown to remain alive and infective for 11 months after their discharge from snails. Copper sulfate in solutions of 1:500 destroyed encysted

cercariae. Our experiments confirm previous findings to the effect that the route of migration of young flukes in the final host is by way of the peritoneal cavity from the intestine to the liver." See also a note by Shirai (E. S. R., 56, p. 175).

Salmon poisoning: Transmission and immunization experiments, B. T. Simms, A. M. McCapes, and O. H. Muth (*Jour. Amer. Vet. Med. Assoc., 81 (1932), No. 1, pp. 26–36*).—In further studies at the Oregon Experiment Station (E. S. R., 66, p. 776), "salmon poisoning has been transmitted from sick to susceptible dogs through blood injections. It has apparently been produced through the injection of encysted cercariae of the salmon-poisoning fluke [*Nanophyetus salmincola*] obtained from parasitized fish. Neither the nature nor the origin of the causal agent has been discovered. Dogs have been immunized against the disease through the simultaneous injection of virulent blood and hyperimmune blood."

The disinfection of anthrax-infected dried hides in the dry condition by means of hydrogen sulphide, M. E. Robertson (*Jour. Hyg. [London], 32 (1932), No. 3, pp. 367–374*).—In work on the disinfection of anthrax-infected dried hides extending over a period of three years, conducted in the laboratories of the British Leather Manufacturers' Research Association at the Lister Institute, "hydrogen sulfide has been found to have a destructive action on dry anthrax spores. Disinfection of hard, dry, very resistant infected hide specimens, in conditions both of ease and difficulty of access of the disinfecting gas, has been obtained by treatment with hydrogen sulfide at 20 and at 37° C. in periods of 7–16 days. The fact that hydrogen sulfide, in the experimental conditions described, penetrates to the middle of a bundle of leather pockets has been verified by its action in disinfecting (sometimes partially—sometimes completely) anthrax-infected threads placed in the middle of such a bundle. Increase of the temperature at which treatment is carried out has been found to hasten disinfection. Disinfection of anthrax-infected threads has been obtained by treatment with equal parts of hydrogen sulfide and air in three days at 60°."

Concerning the variability of the foot-and-mouth disease virus, I [trans. title], K. Trautwein and K. Reppin (*Ztschr. Immunitätsf. u. Expt. Ther., 73 (1932), No. 3–4, pp. 347–359*).—In tests made of 28 type A (=O of Vallée) variants of the foot-and-mouth disease virus a transformation in the antigenic nature of 22 within relatively slight limits was detected. The results obtained in the tests with guinea pigs were confirmed by tests with cattle. The immunity established was similar to that of the standard strain of type A.

Some experiments in rinderpest vaccination: Active immunisation of Indian plains cattle by inoculation with goat-adapted virus alone in field conditions, R. F. Stirling (*Vet. Jour., 88 (1932), No. 5, pp. 192–204, pl. 1, figs. 5*).—Working in the Central Provinces, India, the author finds that goat-virus-alone vaccination confers immunity against rinderpest, the animals having withstood a massive dose of local virus after a lapse of over two months. With the exception of one old bullock that died as the result of resuscitation in virulency of latent coccidiosis, all of the 343 Indian plains cattle subjected in the experiments to inoculation with rinderpest virus adapted to goats by passage survived. They showed undoubted mild rinderpest, but no serious disturbance. On testing their immunity later with cattle virus, either of Muktesar hill bull origin or from the scene of a natural outbreak in the vicinity, they were found to be fully protected. It would, therefore, seem that cattle belonging to these races can be successfully immunized, without unduly serious risk, by inoculation of goat virus alone, and simultaneous inoculation of serum, as is

prescribed in the ordinary serum-simultaneous method of immunization, is unnecessary.

A footnote calls attention to the fact that since the preparation of this account in March, 1932, one of the operators in charge, G. D. Pani, has reported the successful inoculation of over 200 additional cattle with locally adapted goat virus without fatality.

The incidence of gall-stones in cattle, H. Gauss and C. L. Davis (*Jour. Amer. Vet. Med. Assoc., 81 (1932), No. 1, pp. 71–75, fig. 1*).—It is pointed out that cholelithiasis is a general problem in biology to which scant attention has been paid. In a series of 2,067 unselected cattle studied at a packing house in Denver gallstones were found in about 1 per cent, the stones being found in both the gall bladder and bile ducts. Stones occurred most frequently in adult cattle that had been pregnant (cows).

A clinical study of forty cases of disease of the reproductive organs of the cow, D. B. Meyer (*Jour. Amer. Vet. Med. Assoc., 81 (1932), No. 1, pp. 62–70*).—This report from the Michigan Experiment Station for the years 1927 to 1929, inclusive, is based upon a clinical study of a limited number of cases of disease of the reproductive organs of cattle. Clinical records of 40 cases of diseased genital organs of the cow are tabulated. Thirty-four of these were treated for sterility, 9 of which were treated also for retained fetal membranes, and 6 cases were treated for retained fetal membranes only. In treatment of retained fetal membranes, mineral oil and iodoform seemed to be the most reliable when properly administered. However, the 0.7 per cent pepsin solution containing 0.5 per cent hydrochloric acid gave very satisfactory results, in the few cases treated with it, in digesting and loosening the placental areas.

A comparison of the blood and milk agglutination tests in the detection of bovine contagious abortion, R. F. Montgomerie and W. T. Rowlands (*Vet. Jour., 88 (1932), No. 6, pp. 227–236*).—In 615 instances comparative blood and milk samples from 314 cows of known history in North Wales were submitted to the agglutination test for the detection of *Brucella abortus* antibodies.

"The results in testing the serum and the whey from these samples were in agreement in 544 instances (88.5 per cent), 385 negative reactions, 146 positive reactions, and 13 doubtful reactions. In 53 of the 71 disagreements the history of the cow, breeding, and reaction to previous and subsequent tests were sufficient to indicate whether or not she should be regarded as a reactor. The blood test had given the correct, or the more correct, indication in 42 instances, and the milk in 11. When only one test gave a positive reaction in apparently infected cows, the reaction occurred in blood in 18 instances and in milk in 6. Among the disagreements occasioned by the milk test being positive or doubtful when the cow was not infected, 16 appeared to be attributable to the testing of whey from the secretion of an almost dry udder.

"Of 41 cows which during the period of observation became reactors in herds in which periodic testing was being carried out, 30 gave a positive reaction to milk on the occasion of the first blood positive reaction. Of the 11 remaining cows in this group, 8 reactions in blood and 3 in milk occurred while the corresponding test was still negative. In 11 cows, abortion occurred within 6 weeks of nonreaction to the blood test. On the occasion of the test prior to abortion, a doubtful blood reaction was observed in one, a doubtful milk reaction in one, a positive milk reaction in one, and in one milk was not available for test purposes. In the milk test of the remaining seven cows, a negative result was recorded."

The evidence of Brucella abortus infection in slaughterhouse men, J. H. Dible and M. Pownall (*Jour. Hyg. [London], 32 (1932), No. 3, pp. 349–353*).—

The authors find in studies at the University of Liverpool that men engaged in slaughtering and dressing meat show a higher incidence of *B. abortus* agglutinins than those in similar age and sex groups who are otherwise employed, where titers of 1 in 20 and upwards are observed. This applies especially to men who deal with cattle and sheep; no such increased incidence has been noted in men dealing with pigs. It appears that a titer in the vicinity of 1 in 40 serves to indicate evidence of *B. abortus* infection definitely greater than that likely to be found in the generality of the community.

Spontaneous infection with Brucella abortus in the bull, F. B. Hadley and E. B. Osborn (*Jour. Amer. Vet. Med. Assoc., 81 (1932), No. 1, pp. 46–53*).—It is concluded that while the results obtained, in the work conducted at the Wisconsin Experiment Station here reported upon, are not sufficiently definite to justify final conclusions, the following are reasonable:

"Testicle infection with *B. abortus* occurs in the bull from having acquired the organism by natural contacts. Bulls discharging *B. abortus* in their semen are not necessarily capable of infecting susceptible cows which they serve. Bulls may be used for years in badly infected herds yet not acquire the infection. The fact that a bull reacts to the blood test for abortion infection is not conclusive evidence that *B. abortus* is being eliminated in his semen. The higher the agglutination titer in a bull, the greater the possibility of his having an active infection in some organ of the urogenital system."

Experiences in eradicating Bang's disease in three infected herds of cattle, C. F. Clark (*Jour. Amer. Vet. Med. Assoc., 81 (1932), No. 1, pp. 54–61*).—In the three herds under observation at the Michigan Experiment Station here reported upon, infectious abortion "has apparently been eradicated by frequent application of the agglutination test and permanent segregation of positively reacting animals. The abortion rate of animals having a maximum agglutination titer of trace or incomplete in 1:25 did not vary appreciably from those negative. In the three herds studied the abortion rate varied from 0 to 8.3 per cent with a mean of 5.5 per cent."

The incidence of low grade Streptococcus infections in the udder.—Preliminary report, G. J. Hucker (*Cornell Vet., 22 (1932), No. 2, pp. 183–185*).—In studies at the New York State Experiment Station here reported, 150 cows were available for use. Chemical and bacteriological tests were made of from one to three samples of milk from each, but in none of these cows was there any clinical evidence of mastitis. Of 439 quarters studied, 48 per cent showed streptococci in some number, the greater share in numbers less than 100,000 per cubic centimeter. Nearly 18 per cent of the quarters with streptococci showed pus upon post-mortem examination. Seventy-eight per cent of all cows showed streptococci in one or more quarters, and 21 per cent of all cows upon which a post-mortem was made showed pus in one or more quarters. Only 24 per cent failed to show either slight or marked fibrosis. Sixty-six per cent of all the quarters evidenced this change to a marked degree, 14 per cent of these marked cases showed pus on post-mortem, and 37 per cent carried streptococci in the milk. There was no indication of a relationship between the presence of streptococci and the presence of fibrotic tissue.

Six herds selected at random from the number studied showed fibrosis varying from 65 to 98 per cent of the quarters. In the latter instance a high producing herd showed only three quarters which were classified as normal by the examining veterinarian. The number of quarters showing streptococci also varied widely from herd to herd. This variation was from 35 to 60 per cent. No relation between the percentage of fibrosis or presence of streptococci and the general handling of the herd was observed.

A study of 172 cows showed that only 7 per cent did not have some fibrotic tissue in one or more quarters. Not a single individual cow was found free from fibrotic tissue, pus, or streptococci in all four quarters.

A contribution to the bacteriological diagnosis and vaccine therapy of streptococcic mastitis in cattle [trans. title], P. KRAGE and W. GIPMANN (*Arch. Wiss. u. Prakt. Tierheilk., 63 (1931), No. 1, pp. 65–77, figs. 7; abs. in Cornell Vet., 22 (1932), No. 2, pp. 204, 205*).—This is a report of the application of vaccine therapy to a herd of 67 dairy cows, in which 43 were normal and 24 infected at the time the experiment was commenced in October, 1928. Eighteen infected cows were treated with autogenous cultures that were not more than 48 hours old. At the end of the experiment three clinical cases had become normal, six showing changes in the milk giving normal milk, eight unchanged, and all eliminated streptococci. Of 27 normal cows that were vaccinated with cultures, with one exception all udders eliminated streptococci at the end of the experiment; 9 showed distinct changes in the milk; and 10 gave milk normal on macroscopic examination. Six cows with mastitis were treated with killed cultures, 2 of 3 showing marked changes in the udder and milk being cured promptly. Of 3 showing milk changes only, 1 became free from streptococci. Of 16 normal cows that were vaccinated with killed cultures, 15 were eliminating streptococci from the udder at the end of a year.

A study of the tuberculin sensitization in cattle showing subcutaneous lesions, H. MARSH, D. M. WARREN, and A. C. MORROW (*Jour. Amer. Vet. Med. Assoc., 81 (1932), No. 1, pp. 105–117*).—This is a contribution from the Montana Experiment Station reporting upon work that has been conducted during the last four years in an attempt to shed some light on the interpretation of the skin lesion cases. It is concluded that while the observations recorded do not clear up the significance of the teat lesions and other subcutaneous lesions with reference to the work of tuberculosis eradication, they bring out certain facts that may help in the solution of the problem, particularly from the standpoint of the field man doing the actual testing.

Epidural anesthesia in the ewe, C. F. CLARK and L. B. SHOLL (*Jour. Amer. Vet. Med. Assoc., 81 (1932), No. 1, p. 120*).—The authors record the use of epidural anesthesia in sheep at the Michigan Experiment Station in the treatment of cases of prolapsed vagina, a 2 per cent solution of dulcine being administered in doses of 5 c c.

The toxicity of Sorghum halepense (Johnson grass) for sheep, F. H. MANLEY (*Vet. Jour., 88 (1932), No. 6, pp. 260–262*).—Experimental work at the Department of Agriculture of Cyprus has led to the conclusion that Johnson grass when dried in the early stages of its development is extremely poisonous for sheep. Insufficient material was available to determine thoroughly the toxicity of fresh young grass, but in later stages of its growth the plant appeared to be definitely nontoxic.

Brucella agglutinins in the blood of ewes, H. L. GILMAN (*Cornell Vet., 22 (1932), No. 2, pp. 187, 188*).—Of 544 blood samples taken from adult breeding ewes at a large abattoir in Buffalo, N. Y., 500 were negative to the agglutination test for *B. abortus* at a titer of 1:20, 16 were partial reactors, and 18 were positive. Of the remaining 10, 2 were positive to the test at a titer of 1:40 and 8 were partially so.

Encephalitis in sheep, L. P. DOYLE (*Jour. Amer. Vet. Med. Assoc., 81 (1932), No. 1, pp. 118–120, fig. 1*).—This contribution from the Indiana Experiment Station reports two instances of encephalitis in sheep in Indiana during the past few years, involving a single sheep in a flock of 45 and 5 in a flock of 35.

Infectious entero-toxaemia, " pulpy kidney," and other related diseases of sheep, H. W. Bennetts (*Vet. Jour., 88 (1932), No. 6, pp. 248–256*).—A brief account is contributed by the Council for Scientific and Industrial Research at Perth of infectious enterotoxemia, a disease affecting sheep in Western Australia. This is an acute toxemia that follows the rapid multiplication of a specific toxicogenic anaerobic bacterium, *B[acillus] ovitoxicus* n. sp., within the contents of the small intestine, a detailed report of studies of which by the author has been noted (E. S. R., 67, p. 600).

Bacillus abortus (Bang) infection in the horse [trans. title], O. Hultén (*Svensk Vet. Tidskr., 36 (1931), No. 1, pp. 25–27; abs. in Vet. Rec., 12 (1932), No. 26, p. 731*).—A report is made of a case of fistulous withers in a horse which was operated on before a fistula developed. Material isolated from the lesion was subcutaneously injected into guinea pigs, the blood of which did not agglutinate *B. abortus*, with the result that four weeks later the blood of two reacted positively and one negatively to the agglutination test. Agglutination occurred also with 0.005 c c of the horse's serum, but not with 0.002 c c. It is pointed out that the cattle on the farm, the only one on an island in a large lake, were infected, and that the horse was stabled with them with no dividing partition.

Bursitis and Bang infection in the horse [trans. title], H. Magnusson (*Skand. Vet. Tidskr., 22 (1932), No. 3, pp. 95–103, fig. 1, Eng. abs. pp. 102, 103; abs. in Vet. Rec., 12 (1932), No. 20, p. 559*).—The author reviews earlier work on the subject and reports upon the findings in four cases of *Brucella abortus* infection in horses with fistulous withers, from two of which *B. abortus* was isolated in pure culture. He concludes that with a pure culture horses can be readily infected via the conjunctiva so that positive agglutination tests are obtained. In nine cases infected in this way no definite localized lesion was induced. The presence of *B. abortus* in lesions of fistulous withers is considered to be secondary to an already established bursitis arising from some other cause. It is pointed out that this is analogous to the carpal bursitis in cattle and constitutes a similar reservoir of infection.

Lesions in the stomach of a dog simulating actinomycosis, W. H. Feldman and F. C. Mann (*Jour. Amer. Vet. Med. Assoc., 81 (1932), No. 1, pp. 83–91, figs. 4*).—"An extensive infective granulomatous condition limited to the wall of the greater curvature of the stomach of a dog was observed at intervals for about 3½ years. The duration of the disease was uncertain, but it was characteristic of chronicity and of slight progressiveness. The infective character of the lesions was not ascertained until the animal was killed for necropsy."

The differentiation of Pasteurella avicida and Brucella infections in the fowl, M. W. Emmel and M. L. Boevers (*Jour. Amer. Vet. Med. Assoc., 81 (1932), No. 1, pp. 92–104, figs. 2*).—This is a report of experiments contributed from the Alabama Experiment Station confirming the work of Mallmann (E. S. R., 64, p. 556) on the interagglutinability of *P. avicida* and the species of the genus Brucella, the fowl having been found to show a marked response in the production of agglutinins when exposed to Brucella organisms with the reverse true when exposed to *P. avicida* (seven strains). The agglutination test for Brucella would thus apparently have value in determining the presence of Brucella infection in a flock of fowls.

"Acute or subacute fowl cholera can be differentiated from Brucella infection in the fowl bacteriologically by distinct differences in the nature and course of the two infections, as well as by differences in the microscopic pathology produced by the causal organisms. Localized *P. avicida* infection can be dif-

ferentiated from Brucella infection by the macroscopic pathology produced about the head of birds by the former infection, *P. avicida* as a general rule being readily isolated from such lesions."

External temperature as a factor in the production of diarrhea in young chickens, G. E. Hall (*Poultry Sci., 11 (1932), No. 4, pp. 250–254*).—In working at the University of Toronto with eight groups, the author found that "diarrhea can be produced experimentally in baby chicks by exposure to moderate changes in temperature. The gastrointestinal tract of young chickens is more readily affected by changes in temperature than the respiratory tract. It appears that a sudden increase in temperature is as detrimental in its effect as a decrease. The chicks under observation for 10 weeks showed that though the exposure to the change of temperature was not always fatal, there was a serious disturbance in the metabolism which resulted in subnormal development."

Studies of fowl paralysis.—III, Gastronomic enteritis, W. P. Blount (*Vet. Jour., 88 (1932), No. 6, pp. 236–240*).—It was found from a study of 50 outbreaks of paralysis (affecting several hens in each flock), including 19 exhibiting nerve lesions, that at least 90 per cent of the cases were associated with an improper functioning of the gizzard due to a deficiency of insoluble grit, like flint, in the diet. Inflammatory changes occurred in the alimentary canal, notably in the duodenum, and in the majority of instances intestinal parasitosis followed. It is concluded from the study of the prevention of the disease, fowl paralysis, and also of associated paralyses exhibiting as their sole feature numerous intestinal parasites, careful consideration should be given to the management of such birds throughout life in order to insure that grit suitable for the optimum functioning of the gizzard is supplied at all times to be ingested by these animals.

Questions and answers concerning pullorum disease, H. Van Roekel (*Massachusetts Sta. Bul. 284 (1932), pp. 23, figs. 16*).—In this work the author, assisted by K. L. Bullis, O. S. Flint, and M. K. Clarke, has brought together information on the nature, eradication, and prevention of pullorum disease in a readily available and understandable form. The questions and answers, 93 in number, summarize in a practical way the present status and knowledge of the disease and its control.

A comparison of three methods of testing for pullorum disease, with finer interpretations of readings on the old tube agglutination test, A. J. Durant (*Jour. Amer. Vet. Med. Assoc., 81 (1932), No. 1, pp. 37–45, fig. 1*).—In a single test made on a flock of 259 birds in Missouri to determine the relative efficiency of the tube agglutination test, the rapid serum test, and the whole-blood test (using a standard antigen) for the detection of pullorum disease, the results indicate that the tube test is more efficient than the other two.

"The rapid serum test is more efficient in our hands than the whole-blood test. More than twice the number of isolations of the organism were secured from birds positive to the tube test and negative to the other tests. The reading or interpretation of the test may partly account for the better results obtained with the tube test in our hands than the two other methods. Any change from a normal cloudiness in a tube or a so-called granular reaction is regarded as a positive reaction in this laboratory. Of 24 birds which showed the slight reaction or so-called granular reaction, 15 were positive culturally for pullorum disease and 3 of the 9 remaining birds that were negative culturally showed lesions of the disease."

Blood-testing and egg-production, P. L. Shanks and J. M. Gordon (*Vet. Jour., 88 (1932), No. 6, pp. 241–243*).—The authors record the results of an egg-laying trial of 40 hens and the results of an agglutination test for pullorum disease made of each fowl at its conclusion. The 23 nonreactors laid an average during the trial of 204.8 eggs and the 17 reactors an average of 141.8. It is pointed out that only birds which appeared in good health throughout the whole period of the test were included in the 40.

Studies on incubator hygiene.—II, Germicidal effect of formaldehyde, released by potassium permanganate and cheesecloth, R. Graham and V. M. Michael (*Poultry Sci., 11 (1932), No. 4, pp. 197–207, figs. 3*).—In continuation of their studies at the Illinois Experiment Station (E. S. R., 67, p. 460), the authors report upon the germicidal value of formaldehyde gas, released by eight different methods in a clean Buckeye mammoth incubator.

"Two methods, the potassium permanganate (35 c c, 1⅛ oz., formalin and 17½ g, $\frac{6}{10}$ oz., potassium permanganate for each 100 cu. ft. of incubator space), and the formolized cheesecloth (20 c c, or 2.3 oz., formalin per 100 cu. ft.) proved practical in destroying *S[almonella] pullorum*, suggesting that pullorum disease traceable to incubator contamination may be controlled in a definite measure by formaldehyde fumigation. No appreciable difference in germicidal effect on *S. pullorum* was noted in 25 separate fumigations by each of the two methods. The results of fumigation with formaldehyde by the two methods mentioned, as measured by viability of *S. pullorum* on contaminated materials, permit the assumption that air-borne or droplet infection accessible to the fumigant is promptly destroyed.

"The physical character, as well as the location of the *S. pullorum* contaminated materials in the incubator, influenced the germicidal value of the fumigant. With few exceptions, *S. pullorum* on heavily inoculated cotton squares and eggshells was killed within 30 minutes when exposed to the fumigant on all sides. When the contaminated materials were exposed in open Petri dishes and open shell vials which were placed on the floor of the incubator, *S. pullorum* displayed a viability range of 180 minutes, but was usually killed within 90 minutes by the formaldehyde fumigation. The range of viability of *S. pullorum* on artificially contaminated feet and down of live chicks was likewise found to be greater than the average time required to destroy *S. pullorum* on the same materials. Chicks immersed in a suspension of *S. pullorum* and subjected to fumigation showed viable *S. pullorum* in the down as long as 120 and 180 minutes, but usually the microorganisms on chicks artificially contaminated with *S. pullorum* were killed within 90 minutes or less.

"In seven different hatches of chicks subjected to formaldehyde fumigations by the cheesecloth method, at two 12-hour intervals, and six hatches by the potassium permanganate method, at three 12-hour intervals, no serious injury was noted though transitory symptoms of irritation were occasionally observed following three releases of formaldehyde by the potassium permanganate method. Irritation was not observed in chicks fumigated by the cheesecloth method."

A list of 16 references to the literature is included.

New disease in young rabbits, infectious tympanitis, Z. Morcos (*Jour. Bact., 23 (1932), No. 6, pp. 449–454, figs. 3*).—A report is made upon studies of an outbreak of a disease at a small breeding station near Guiza, Cairo, Egypt, in which young rabbits between one and five months old died after a short course of illness. In this outbreak adult rabbits escaped, and contact guinea pigs at the same farm escaped also. The organism isolated is similar culturally and morphologically to *B[acillus] chauvoei*, but is totally different on cross immunization. "The organism is very actively motile, sporulates

with difficulty, does not form chains, and does not kill laboratory animals before 36 hours; it is thus distinguished from *B. welchii*, *B. oedematiens*, and *B. oedematis-maligni*. The organism causes tympanitis and death in young rabbits. It may be called *B. tympani-cuniculi*. Filtrates of infected tissues or cultures are protective to young rabbits. Heated and 5 per cent ether-treated cultures are protective to young rabbits, and if given to pregnant rabbits early may produce resistance in offspring. Serum obtained from immune rabbits does not protect young rabbits."

AGRICULTURAL ENGINEERING

International directory of agricultural engineering institutions, A. BRIZI (*Les Institutions de Génie Rural dans le Monde. Rome: Inst. Internatl. Agr., 1932, 3. ed., rev. and enl., pp. VI+[5]+178*).—This is the third revised and enlarged edition of this book (E. S. R., 66, p. 376).

A method of estimating ground-water supplies based on discharge by plants and evaporation from soil: Results of investigations in Escalante Valley, Utah, W. N. WHITE (*U. S. Geol. Survey, Water-Supply Paper 659–A (1932), pp. V+105, pls. [10], figs. 29*).—The results of investigations in the Escalante Valley, Utah, of the influence of evaporation and transpiration on ground-water level are reported, and a method of measurement based on the daily fluctuations of the water table is described.

Altogether about 75 shallow test wells were put down in this area of ground-water discharge in fields of all kinds of native ground-water plants and in fields of naturally subirrigated alfalfa. The area chiefly studied comprises about 32,000 acres in the vicinity of Milford. Fluctuations of water levels in these wells were measured regularly with a steel tape, and on most of them automatic water-stage recorders were maintained for varying lengths of time. As a check, test wells were put down and equipped with recorders in areas outside the valley, including Beaver Valley in the neighborhood of Beaver, Utah, and Snake Valley and Lake Valley, Nev. The records obtained from these observation wells show that during the growing season there is a marked daily fluctuation of the water table nearly everywhere in fields of ground-water plants. Usually the water starts down at 9 to 11 a. m. and reaches its lowest stage at 6 to 7 p. m. At 7 to 9 p. m. the water begins to rise and continues to rise until 7 to 9 a. m. the following morning. The maximum daily drawdown observed during the investigation amounted to about 1.5 in. in greasewood and shad scale, 2.5 in. in alfalfa, 3.75 in. in salt grass, and 4.5 in. in sedges and associated marsh grasses. The fluctuations do not occur in plowed fields, cleared lands, tracts of sagebrush, and tracts where the water table is far below the surface. In general they begin with the appearance of foliage in the spring and cease after killing frosts. They cease or are materially reduced after the plants are cut.

The water table rises sharply almost immediately after a rain in fields of ground-water plants during the growing season, even though the rain is light and affords no ground-water recharge. There is little or no rise of the water table after rains in cleared lands at any time or in fields of ground-water plants when plant life is dormant.

In interpreting the fluctuations of the water table in terms of water used by the plants, cylinders were driven near observation wells so as to inclose columns of undisturbed soil in the zone in which the fluctuations take place, and the rise and fall of the water table in the inclosed columns after the addition or subtraction of measured amounts of water were carefully noted. From these experiments the specific yield of the soils was determined. The amount of ground

water discharged daily by the plants was then computed by the formula $q=y\ (24\ r\pm s)$, in which q is the depth of ground water withdrawn, in inches, y is the specific yield of the soil in which the daily fluctuation of the water table takes place, r is the hourly rate of rise of the water table, in inches, from midnight to 4 a. m., and s is the net fall or rise of the water during the 24-hour period in inches. In field experiments the quantities on the right-hand side of the formula except the specific yield can be readily determined from the automatic records of water-table fluctuations.

Ground-water plants were raised in four tanks filled with soils of the types to which the plants are partial, provided with an automatic measured water supply, and otherwise equipped so as to duplicate as closely as possible conditions that exist in the field. A companion tank was provided for the vegetation tank to determine the discharge of ground water by evaporation alone. This tank was filled with bare soil of the same type as that in the corresponding vegetation tank, and the water table in it was maintained at similar depths. In this way the attempt was made to differentiate transpiration losses from evaporation losses. Daily fluctuations of the water table similar to those that occur in the field were obtained in the vegetation tanks. These fluctuations were correlated with the daily ground-water discharge as indicated by the measured water supply delivered to the tank. The amount of water required to produce a unit weight of dry vegetable matter in the tanks was computed, and the coefficient of ground-water discharge thereby obtained was applied to the field on the basis of dry weight of vegetable matter produced per unit area. Four water-surface evaporation pans were kept in operation in order to have a common basis for comparison, a determination being made of the ratio between all ground-water discharge disclosed by the tank experiments and water-surface evaporation for corresponding periods.

The data obtained indicate that the key to the interpretation of the daily fluctuations of the water table in terms of ground water consumed by the plants lies in the specific yield of the soils in which the fluctuations take place and in the rise of the water table during the middle hours of the night, when the ground-water discharge is practically negligible and the hydraulic head induced by the daytime drawdown is about average for the 24 hours. The investigation indicates further that the annual growth put on by the plants is an index of the ground-water supply which they consume during the season.

Surface water supply of the United States, 1930, Parts 2, 12C (*U. S. Geol. Survey, Water-Supply Papers 697 (1932), pp. VII+249, fig. 1; 709 (1932), pp. VI+160, fig. 1*).—Of the papers which here present the results of measurements of flow made on streams during the year ended September 30, 1930, No. 697, prepared in cooperation with the States of Virginia, North Carolina, and Florida, covers the South Atlantic slope and eastern Gulf of Mexico drainage basins; and No. 709, prepared in cooperation with the States of Oregon and Washington, the Pacific slope basins in Oregon and the lower Columbia River Basin.

Developments in irrigation practices, H. A. Wadsworth and H. R. Shaw (*Hawaii. Sugar Planters' Assoc. Proc., 51 (1931), pp. 507–559, figs. 40*).—A description is given of the more recent developments in irrigation practices for sugarcane in the Hawaiian Islands, and the results of experiments with some of these are reported.

It is pointed out that widespread developments in methods of irrigation designed for greater economy of labor and water have taken place recently on Hawaiian plantations. Although many of the methods are not universally adaptable, the results gained in labor economy, water conservation, improved

moisture distribution, and economical cultivation in many localities warrant careful scrutiny and trial.

Certain modifications of the Hawaiian contour system have proved economical in operation, are readily installed in ratoon fields, and are adapted to a wide range in terrain. Several cut-line methods which are under trial are here described. The Koloa system has been given extensive trial on many plantations. In spite of difficulties encountered in certain topography and on certain soil types, the method in general seems to be successful and popular. Long-line irrigation shows promise in many localities where it has been installed. The use of mechanical cultivation in conjunction with long-line irrigation appears to be a decided advantage in favor of the method. The border method of irrigation is proving particularly effective on most lands carrying slopes no greater than about 2 ft. per 100 and which are difficult to irrigate by the contour method. Plantations using the border method have greatly increased the area irrigated per man day but have found a somewhat greater consumption of water than by the contour method.

Comparatively little ditch lining has been completed of late on Hawaiian plantations. Water measurement on many plantations is becoming an important unit in the system of distribution and application of irrigation water. The Parshall measuring flume has become the standard device for measuring water in supply and straight ditches on many plantations. There is a need for a simple device for measuring the discharge of water in ditches of low gradient.

Pump irrigation and water table studies, H. E. WEAKLY (*Nebraska Sta. Bul. 271 (1932), pp. 14, figs. 5*).—The first section of this bulletin reports costs and returns from pump irrigation at the North Platte Substation for the eight years from 1924 to 1931. Results for three years, 1924 to 1927, were previously reported in Bulletin 227 (E. S. R., 59, p. 678). The second section reports the results of preliminary studies of variations in the water table as caused by pumping.

The effect of frequency of irrigation on potatoes grown in Mimbres Valley, New Mexico, D. W. BLOODGOOD (*New Mexico Sta. Bul. 205 (1932), pp. 28, figs. 3*).—This report is based on five years' investigations, conducted by the station in cooperation with the U. S. D. A. Bureau of Agricultural Engineering, regarding the effects resulting from different frequencies of irrigation on potatoes.

Three fields of different soil types and at different locations in the valley were used for the investigations. The soils are classified as the mound phase of Mimbres fine sandy loam, Mimbres silty clay loam, and Karro clay, respectively. Each field was divided into six plats, all of which received different numbers of irrigations during the season. Irish Cobbler certified seed potatoes were used throughout the investigations.

The irrigation water was supplied by centrifugal pumps from an underground water supply. All of the water was measured, over weirs, except in 1927. The furrow system of irrigation was used, and the plats were irrigated at 1-, 2-, 3-, and 4-week intervals.

The yields of potatoes increased with the increase in number of irrigations and amount of water applied, up to nine applications. The results indicate that it is necessary to irrigate frequently to produce satisfactory yields. It is doubtful whether irrigations applied within two or three weeks of harvesting had much influence on the yield.

The highest average yield, 9,435 lbs. per acre, was obtained with 9 irrigations applied at 1-week intervals after about May 3, using an average of 24.6 acre-in. of water. The highest estimated average duty of water, 494 lbs. of

potatoes per acre per acre-inch, was obtained with 4 irrigations, using an average of 12.2 in. of water.

Soil type was an important factor, the fine sandy loam producing 74 per cent more marketable tubers with use of less water than the silty clay loam, the average yields being 8,692 and 4,998 lbs. per acre, produced with average annual applications of 14.6 and 17.8 acre-in., respectively. With 9 irrigations using 21.4 acre-in. of water, the sandy loam produced on the average 12,056 lbs. of potatoes per acre. Soil texture also affected the grade of the potatoes.

The frequency of irrigations and amount of water applied affected the grade of potatoes. As the frequency of irrigations and the quantity of water increased, the percentage of grade No. 1 potatoes increased and the percentage of grade No. 2 potatoes decreased. The highest average percentage of grade No. 1 potatoes was obtained from plats receiving from 7 to 10 irrigations.

Erosive effects of heavy summer rains in southeastern Washington, W. A. Rockie and P. C. McGrew (*Washington Col. Sta. Bul. 271 (1932), pp. 8, pls. 7*).—In a contribution, based upon investigations by the station in cooperation with the U. S. D. A. Bureaus of Agricultural Engineering and Chemistry and Soils, the conditions and results of an individual storm of the type that is infrequent but damaging are described and illustrated.

The farm land within the area affected is typical of the Palouse country, and the soil was largely the Palouse silt loam. The washing off of the soil in summer-fallowed areas was found to have started, for the most part, within 15 ft. or less from the ridge crest. Thus, water accumulating within a distance of 15 ft. was sufficient, on many slopes, to cut the soil away to plow-sole depth. The washes generally widened down the slope. Several alfalfa fields were carefully examined, and on none of them could any marked evidence of soil washing be found.

Floods of two types in Middle Rio Grande Valley, R. G. Hosea (*Engin. News-Rec., 109 (1932), No. 4, pp. 100–102, figs. 4*).—In a contribution from the Middle Rio Grande Conservancy District, data from stream flow studies and other observations are reported showing that the flood peaks are dependent upon geographic position rather than drainage area.

It has been found that floods in the middle valley of the Rio Grande are of two distinct types, namely, (1) those due to melting snow in the mountains and (2) those due to summer and fall storms on tributaries entering the river below Embudo, N. Mex. Flood probability studies indicate that the flood peak at Albuquerque in either case will not exceed 30,000 sec.-ft. for 98 per cent of the time. Below the Rio Puerco the flood peak magnitude decreases due to snow, but that of summer and fall floods increases materially. At San Acacia floods of 50,000 sec.-ft. are not impossible if the Rio Puerco and Rio Salado should flood at the same time. Otherwise the 2 per cent chance flood is about 36,000 sec.-ft. from the Rio Puerco alone. At San Marcial it is probable that a flood of 32,000 sec.-ft. will not be exceeded for 98 per cent of the time.

The position of the Rio Puerco and Rio Salado is favorable to the production of relatively large flood peaks, while that of the main drainage area and the eastern tributaries is unfavorable for such peaks. A flood-detention reservoir, to be effective, would have to be located below Embudo and preferably below Buckman. The proposed reservoir at the Colorado State line would have little value for flood protection, though it might have considerable value for other purposes, particularly for storing any drainage return flow that may come into the river above the State line.

Land drainage, W. L. Powers and T. A. H. Teeter (*New York: John Wiley & Sons; London: Chapman & Hall, 1932, 2 ed., rev. and enl., pp. X+353, figs. 169*).—This is the second revised and enlarged edition of this book (E. S. R., 47, p. 88). It consists of four parts, dealing with field drainage, district drainage, special drainage problems, and drainage surveying. It takes into account the advances made in the decade since the first edition relating to river and flood control, soil erosion and terracing, use of explosives in drainage and clearing, drainage by pumping from wells, vertical drainage, and the development of pumping machinery and ditch building methods.

Appendixes contain farm drainage laboratory exercises, tables for use in Kutter's formula, and the United States census of drainage for 1930.

A comparison of the pollution and natural purification of the Connecticut and Delaware Rivers and the Brandywine Creek, L. R. Setter (*New Jersey Stas. Bul. 545 (1932), pp. 40, figs. 18*).—Pollution and natural purification studies on three eastern streams of different size are reported. The mean monthly average discharge of these streams during the studies varied between 145 and 12,300 cu. ft. per second. From 11 to 23 sampling stations were located on each of the three streams, and from 10 to 13 sampling stations on each stream were sampled daily, semiweekly, or weekly, depending on the importance of the sampling station. The results obtained showed that a 70 per cent reduction of *B. coli* organisms occurred in less than 20 hours of flow from all sources of pollution irrespective of the concentration of the organisms. At sources of pollution where the initial *B. coli* concentration was greater than 1,000 per milliliter, a 70 per cent reduction was observed in less than 10 hours of flow. At sources of pollution where the initial *B. coli* concentration was greater than 10,000 per milliliter, 85 per cent reduction was observed in 10 hours and 99.9 per cent reduction in 110 hours.

No increase in *B. coli* numbers beyond sources of pollution was observed on any of the three streams studied.

The reduction of *B. coli* numbers in the streams studied was more rapid than in reported observations by others on the Ohio and Illinois Rivers. The deoxygenation coefficient, K_1 at 20° C., varied between 1.46 and —2.1, depending upon the amount of sedimentation or scouring. If the factors of sedimentation and scouring are eliminated as far as possible, an average deoxygenation value of 0.18 is obtained on the three streams. The reaeration coefficient, K_2 at 21 to 23°, varied from a negative value to 1.5.

The general conclusion is that the death rate of *B. coli* organisms in a stream appears to be similar to the mortality of organisms subjected to disinfectants. The numbers of *B. coli* organisms surviving after an interval of time in the environment of a natural stream can be expressed by an equation of the form $-\frac{dn}{dt}=Kn\times f(n)$. For the streams studied this equation has the approximate form $-\frac{dn}{dt}=Kn^{1.4}$ which upon integration has the form

$$K=\frac{1}{0.4}\times\frac{1}{t_2-t_1}\times\left(\frac{1}{n_2^{0.4}}-\frac{1}{n_1^{0.4}}\right)$$

where n is number of organisms and t is the time factor. *B. coli* organisms or individual organisms of a definite type or strain have varying resistance to environmental conditions. Sedimentation velocities have little effect upon the reduction of *B. coli* organisms. The percentage of *B. coli* remaining after an interval of time is dependent upon the initial concentration of organisms at the source of pollution.

Public Roads, [August, 1932] (*U. S. Dept. Agr., Public Roads, 13 (1932), No. 6, pp. 89–104+[2], figs. 10*).—This number of this periodical contains the current status of Federal-aid road construction as of July 31, 1932, and the following articles: Rationalization and Simplification of Test Requirements for Liquid Asphaltic Materials, by E. F. Kelley and P. Hubbard (pp. 89–96, 104); The Batching Plant in Concrete Paving Work, by A. P. Anderson (pp. 97–103); and Connecticut Avenue Experimental Road Now 20 Years Old (p. 104).

The durability of fence posts, J. C. Wooley (*Missouri Sta. Bul. 312 (1932), pp. 8, figs. 4*).—The results of experiments on the treatment of fence posts are reported, the different kinds of treatments being described. These included setting in gravel, charring, coating with carbolineum, applying two brush coats of creosote, 2-hour open-tank creosoting, and 5-hour double-tank treatment with creosote.

The results to date show that the serviceable life of some of the less durable varieties such as hickory, willow, cottonwood, birch, ironwood, sycamore, basswood, and persimmon may be increased three times or even more by the 5-hour double-tank creosote treatment, but when the cost of this treatment is computed and the annual cost per post is considered they are more expensive than other types of available posts.

Species showing sufficiently increased service from treatment to make the process economical included white cedar, white oak, red oak, and black ash. During 1927, 166 posts were treated by the steeping process, using zinc chloride, 5 per cent solution, as one treatment and sodium fluoride, 3 per cent solution, for the other. In order to prevent stock from licking the treated posts and to prevent some leaching out of the preservative, the posts were given a brush coat of discarded crank case oil, and to one set of posts a coating of creosote paint was applied. Eleven different varieties of wood are included in the test. To date 2 failures out of 50 posts are shown in the zinc chloride treatment and 21 failures out of 50 posts in the sodium fluoride treatment. The cost of treatment per post with zinc chloride over the check post was 10.3 cts. For the sodium fluoride all items of cost were the same except for the chemical which amounted to 0.0129 ct., making a total cost per post for the treatment of 9 cts.

Brief information also is given on growing fence posts on the farm, concrete posts, and steel posts.

First report of the Steel Structures Research Committee, C. D. M. Hindley et al. (*London: Dept. Sci. and Indus. Research, 1931, pp. XII+276, pls. 15, figs. [111]*).—This report reviews present methods and regulations for the design of steel structures, brings together the results of investigations of the application of the modern theory of structures to the design of steel structures, and presents recommendations for the practical use of such of the results as would appear to lead to more efficient and economical design.

Estimating building costs, F. E. Barnes (*New York and London: McGraw-Hill Book Co., 1931, 3. ed., rev., pp. XV+656, figs. 252*).—This is the third edition of this handbook. According to the author every section has been revised where necessary to meet changed conditions. The chapter on heating and ventilation has been entirely rewritten, and new chapters have been added on the insulation of buildings, storage silos and circular bins, concrete masonry, and cement gun work.

The saturation pressure of engine fuel and a new method for its determination [trans. title], Wawrziniok (*Automobiltech. Ztschr., 34 (1931), Nos. 28, pp. 653, 654, fig. 1; 31, pp. 724–726, figs. 5*).—A new method and apparatus

for measuring the saturation pressure of liquid fuels for use in internal-combustion engines in relation to temperature is described and illustrated, and experiments with different fuels are reported.

The saturation pressures of light, medium, and heavy benzines showed wide differences. The light benzine requires only a little preheating owing to its high saturation pressure and low surface tension, whereas the medium and heavy benzines with lower saturation pressures require more preheating.

Experiments on the effect of mixing fuels on the saturation pressure showed that the saturation pressures of mixtures as well as the temperatures of vaporization combined the properties of the mixed liquids through which the former was raised and the latter lowered. The same result was obtained by adding alcohol to pure benzol in the proportions of 40 per cent of the former to 60 per cent of the latter, in spite of the low saturation pressure of the alcohol. This was especially true at higher temperatures.

The conclusion is drawn that the addition of alcohol to benzol and benzine is not only not injurious but improves these fuels for use in internal-combustion engines.

Investigations on lubrication [trans. title], O. WALGER (*Ztschr. Ver. Deut. Ingen., 76 (1932), No. 9, pp. 205–208, figs. 5*).—Studies conducted at the Technical Academy of Karlsruhe on the hydrodynamic theory of friction bearings are reported in which viscosity of lubricant, load, speed of journal, and bearing clearance were varied.

It was found that in the region of semifluid friction a strong influence of adsorption between lubricant and bearing surface is felt. The character of the added lubricant also had an important influence. When conditions of semifluid friction prevailed the addition of colloidal graphite to the lubricant decreased the friction values markedly.

Preliminary experiments with new synthetic lubricants which contain no oil or fat gave favorable friction values.

The results in general showed that the hydrodynamic theory is applicable to conditions of fluid friction, but that the limits of semifluid friction must be recognized and accounted for because oil properties other than viscosity are of essential importance in that region.

Further experiments in electrofarming ([*United Provs. Agra and Oudh, Dept. Agr.*] *Bul. 61 (1932), pp. IX+37, pls. 11*).—Following a brief discussion of simple methods of electrical treatment of plants and seeds by the hydroelectric grid area and by radiomagnetic equipment, experiments on different treatments of plants and seeds are reported.

Strawberry plants treated with a high-tension spark showed improvement in growth and fruit. Plants placed in a radiomagnetic cradle showed noticeable improvement in growth, tillering, fruit, and resistance to virus diseases. Twenty branches with ripening berries caught in a loop or collar of soft-iron magnet yielded earlier, better, and brighter fruit than the remaining branches of the same plant.

The germination and growth of 20 different kinds of flower seeds were forced up to 30 per cent over the controls by radiomagnetic treatment of the bed. X-rayed cotton and barley seeds gave the best results as regards germination, growth, and maturity in comparative tests of X-ray, violet ray, ultraviolet ray, and radiomagnetic treatments. The ultra-violet ray treatment reduced the germination period from 7 to 4 days. X-ray and radiomagnetic cradle treatments gave the best results as regards germination, growth, maturity, and yield of miscellaneous hill crops, including beans, millet, rice, and peas.

Leaf curl in tomatoes appears to have been suppressed under experimental conditions by means of atmospheric electricity. The efficacy of electrocultural

treatment of sugarcane in resisting attacks of white ants was demonstrated, and the slow continuous treatment received in the radiomagnetic bed was shown to increase the size of gooseberry plants and the yield of fruit. Bamboo seedlings also were found to respond actively to electrocultural treatment.

A symposium of opinions on the general subject of the electrical treatment of crops is included.

German farm wagons, J. Balkenholl (*Deutsche Ackerwagen. Berlin: Deut. Landbuchhandl., [1932], pp. IV+154, illus. 37*).—This is a treatise on farm wagons as they are used in German agriculture.

Studies of the adaptation of wagons to specific requirements led to the conclusion that where they are drawn by animals the diameter of the wheels should be as large as possible and the wheel rims as broad as possible consistent with other features of construction, also that the track should be as wide as possible. The diameter of the axles should be reduced to the minimum. The wagon bed should be relatively narrow with reference to the wheel track width to allow ease in turning. The total weight of the wagon should be reduced to the minimum consistent with the load to be hauled.

The different types of wagons used in German agriculture are described and their uses for different purposes discussed.

Methods for preparing a seedbed for winter wheat, H. J. Harper (*Jour. Amer. Soc. Agron., 24 (1932), No. 4, pp. 322–328, figs. 2*).—The Killefer chisel required more power to operate than the one-way disk or moldboard plow in Oklahoma Experiment Station studies on Kirkland loam soil near Stillwater, and its use did not result in as much wheat as where a one-way disk was used to prepare the seed bed. Where much vegetation was on the soil, the Killefer chisel clogged easily due to trash collecting on the standards supporting the chisels, whereas the one-way disk operated satisfactorily under such conditions. On a friable brown sandy loam with a friable reddish brown sandy clay subsoil near Carrier, Okla., early plowing with a moldboard plow returned much larger wheat yields over four years than when either a lister or a one-way disk was used to prepare the seed bed. The lister and one-way disk produced about the same effect on the growth and yield of wheat. Early preparations (about July 15) were much more productive than later ones (September 1) with the same implements.

Fertilizer distribution with different machines [trans. title], L. Tinnefeld (*Zuckerrübenbau, 13 (1931), No. 12, pp. 197–202, figs. 8*).—Experiments on the distribution of artificial fertilizers in soil by different tillage machines are reported. Harrowing once and twice placed some of the fertilizer at a depth of 3 in., although the major portion remained at a depth of only 1.5 in. Cultivation to a depth of 6 in. placed some of the fertilizer 4.75 in. deep, although half of it still remained at a depth of 1.5 in.

Scarification produced complete uniform distribution of the fertilizer throughout the seed bed. However, the process proved expensive and impractical, especially in stony soils.

Plowing gave the best practical results in fertilizer distribution. Plowing at a depth of 12 in. using a jointer placed most of the fertilizer at a depth varying from 6 to 12 in. Without the jointer the fertilizer was placed at a depth varying from 4 to 10 in., with very little left in the surface layer of soil.

The best fertilizer distribution and mixing with soil was obtained by cultivating to a depth of 9.5 in. When a subsoil fertilizer plow was used, the fertilizer was placed at a depth of from 13 to 15 in.

The mechanical harvesting of cotton, H. P. Smith, D. T. Killough, M. H. Byrom, D. Scoates, and D. L. Jones (*Texas Sta. Bul. 452 (1932), pp. 72, figs. 37*).—This bulletin reviews the history and development of cotton harvesting

machinery, and reports the progress results of studies conducted over a period of five years at the station in the development of a cotton harvester as a tractor attachment equipped with smooth rubber revolving stripping rolls.

The results show that the slot-type stripper (sled) harvested in 1928 an average of 73.4 per cent of the cotton from 12 varieties tested. In 1929 when smooth revolving rubber stripping rolls were used, an average of 77.9 per cent of the cotton was harvested from six varieties tested. The tractor-mounted cotton harvester developed by the station, which was equipped with rubber stripping rolls, one of which was yielding, harvested in 1930 an average of 88.6 per cent, but when improved in 1931, it harvested 91.1 per cent of the total yield of cotton from three varieties tested for the two years.

Improvements made in cotton harvesting machinery resulted in a considerable reduction of trash collected with the machine-harvested cotton. The home-made, slot-type stripper, used in 1928 collected 42.8 per cent of trash, while the Texas Station cotton harvester collected in 1931, 34.7 per cent trash for the same three varieties.

In harvesting trials with a number of varieties of cotton, it was found that many of the varieties were not well suited to harvesting by machinery. From the information secured by studying varietal characteristics, it was evident that a type of cotton with large storm-resistant bolls, a minimum of vegetative growth, and an early short fruiting period was necessary to get the highest efficiency from a mechanical harvester.

Breeding work to develop a variety of cotton to meet the requirements of mechanical harvesters indicates that satisfactory progress has been made.

Cotton harvested with the various types of mechanical harvesters was cleaned on special bur-extracting and cleaning equipment. When the machine-harvested cotton was cleaned before ginning, approximately 32.1 per cent of trash was removed. This left 67.9 per cent of cleaned seed cotton, in which a small amount of trash remained. In ginning, 4.7 per cent of trash was removed. The machine-harvested cotton in 1931, after being cleaned and ginned, had the same staple length as hand-picked cotton, and was only one-half grade lower than hand-picked cotton.

The cost of harvesting a bale of cotton with the 1-row Texas harvester amounted to $3.08 as compared with $15.75 for hand-snapping. The cleaning and ginning charges on a bale of mechanically harvested cotton were $11 and for hand-snapped cotton $10.50. The slightly higher cost of cleaning and ginning the mechanically harvested cotton is due to the fact that an average of 100 lbs. more of machine-harvested cotton is required to make a 500-lb. bale of lint. The total cost therefore of harvesting, cleaning, and ginning a bale of mechanically harvested cotton averaged $14.08, while a bale of hand-snapped cotton cost $26.25.

A complete list of the patents that have been granted on various types of cotton-harvesting equipment is given.

The vertical seed-cotton drier, C. A. Bennett (*U. S. Dept. Agr., Misc. Pub. 149 (1932), pp. 8, figs. 7*).—This publication describes a simple installation which will dry sufficient seed cotton at a continuous rate to prevent interruptions in ginning caused by wide variations of weather and of moisture conditions in cotton.

In the process involved the damp seed cotton is treated with a continuous current of hot air, at the rate of from 40 to 100 cu. ft. of hot air for each pound of damp seed cotton, the damp seed cotton is exposed to the drying process for different periods, usually from 45 seconds to 3 minutes, and the temperature of the drying air should preferably be between 160 and 200° F. for cotton handled during the early part of the ginning season. Temperatures

as high as 225° have been used satisfactorily with late-season wet cotton. Tests have indicated that these temperatures have no unfavorable effect on the planting quality of the cottonseed.

Equipment required by this process includes a suitable drying cabinet or tower, a vacuum-wheel type of separator, two fans (generally), means for heating air, and the necessary cotton piping.

1931 farm equipment census (*Farm Machinery and Equipment, No. 1782 (1932), p. 6*).—Data obtained from the U. S. Department of Commerce, Bureau of the Census, are reported indicating that the total value of farm equipment and related products manufactured in the United States in 1931 amounted to $210,068,466, as compared with $505,717,023 for 1930 and $606,621,812 for 1929. The greatest decreases were in tillage and harvesting machinery and tractors.

Air circulation and temperature conditions in refrigerated carloads of fruit, H. M. Newell and J. W. Lloyd (*Illinois Sta. Bul. 381 (1932), pp. 157–224, figs. 37*).—Data showing air circulation and temperatures observed in 18 carloads of apples, peaches, and strawberries shipped under various conditions are presented and discussed.

Cars without floor racks, when loaded with bushel baskets of apples, developed large temperature gradients in the bottom layers and large vertical gradients near the bunkers. Temperature gradients were small in the top layers of such cars and in the stacks near the middle of the cars. Cars of apples loaded on floor racks showed large vertical temperature gradients in all stacks and relatively small horizontal gradients in all layers. Average temperature drops were more rapid in cars equipped with floor racks than in cars without that equipment. Air circulation appeared more active in cars with floor racks than in those without them. The greatest difference in circulation appeared in the upward movement of air through sections of the lading near the doors. The chief value of floor racks appeared to lie in their ability to supply cold air to the sections of the cargo near the doors rather than in the promotion of free circulation along the floor. Refrigeration was more rapid and more uniform in a carload of apples packed in bushel boxes than in comparable cars of apples packed in bushel baskets.

In well-built refrigerator cars, when the lading has been thoroughly cooled, the ice supply can fall well below half the maximum capacity of the bunkers without allowing an increase in fruit temperatures. This applies to cars with ice bunkers of about 10,000 lbs. capacity. The size and character of the lading, as well as its temperature, undoubtedly will influence the extent to which the ice supply can be depleted without causing temperature increases in the load.

Forced air circulation in a carload of peaches materially increased the rate of cooling of the fruit and decreased temperature gradients throughout the load. In carloads of peaches and apples both air movement and rate of cooling of fruit were greater when the lading was warm than after it had been cooled for several hours. Data concerning the effects of motion of a refrigerator car on air circulation within indicate that such motion does not necessarily affect the convection currents within the car.

Air movement through the load as a whole in strawberry cars appeared as active as in carloads of peaches and apples, but load velocities, or movements of air through the load, were lower in berry cars, probably because of larger air channels. Longitudinal and vertical air channels appeared to be necessary for maximum circulation in carloads of strawberries. Open centers in carloads of strawberries had no beneficial effects on air circulation and seemed to retard air movement through the bracing stacks.

Thermostatically controlled master valves as heat controllers for buildings, F. E. Goetz (*Colorado Sta. Bul. 393 (1932) pp. 24, figs. 9*).—Studies in three buildings on the campus of Colorado Agricultural College of the action of thermostatically controlled master valves to ascertain their value as a means of controlling temperatures in buildings are reported.

It was found that the master controls maintained comfortable, even temperatures free of extremes at all times except during high winds. Night temperatures were kept down, but never so low but that the buildings could be heated to day temperatures in less than three hours. Excess ventilation was materially reduced, thereby conserving considerable heat which would otherwise have been wasted.

Steam consumption was materially reduced, estimations indicating an average saving of about 44 per cent during the two test periods run on the buildings. A saving in fuel consumption was shown in spite of an increased load on the heating plant and lower average temperature for the season. The fuel saving under these conditions amounted to about 12 per cent, and not only paid for the entire equipment but showed a considerable profit on the investment.

AGRICULTURAL ECONOMICS AND RURAL SOCIOLOGY

Multiple correlation analysis as applied to farm-management research, S. W. Warren (*New York Cornell Sta. Mem. 141 (1932), pp. 37, figs. 5*).—The author calls attention to previous contributions to methods of correlation analysis and to the precautions that should be taken in their use, particularly in farm management research.

In the matter of determining the relative importance of factors influencing the income of the farmer, the "regression coefficients as computed by multiple correlation have usually been considered a method by which the change in income due to changing one factor can be found, eliminating the effect of all other factors studied.

"Independent variables which have a causal relationship to one another should not be included in the same multiple correlation problem, whether it be linear, curvilinear, or joint. In multiple linear and curvilinear correlation analyses the factors should be chosen so that the effect on the dependent variable due to a change in one independent variable does not depend on the magnitude of another independent variable."

Two factors affecting income, picked at random, will either bear a joint relationship with income or a relationship with income not joint. There may be either intercorrelation with causal relationship or intercorrelation without causal relationship between the two factors. In the case of both joint relationship with income and relationship with income not joint, the two factors may not be intercorrelated.

The propositions set forth are developed by the analysis of farm management data taken in Livingston County, N. Y. In this connection, causal relationship between two independent variables is discussed. The conclusion is reached "that no two independent variables which have a causal relationship with each other should be included in the same linear, curvilinear, or joint correlation problem." Instances are cited in which linear or curvilinear correlation might be used.

Several examples of correlation analysis as used in the farm management field by other workers are discussed in the light of the foregoing.

[Investigations in agricultural economics at the Ohio Station] (*Ohio Sta. Bimo. Bul. 158 (1932), pp. 189–191*).—Included are papers entitled Farm Foreclosures by Life Insurance Companies, by F. L. Morison, and The Trend

of Farm Product Prices, by J. I. Falconer, showing wholesale prices of farm products, retail food prices, and cost of living (1913=100) for 1920, 1922, 1924, 1926, by years 1928–1931, and for January and May, 1932, and Index Numbers of Production, Prices, and Income, by Falconer (E. S. R., 67, p. 613), these index numbers being brought down through June, 1932.

Farm data in 1930 census (*U. S. Dept. Agr. Yearbook 1932, pp. 479–499, figs. 14*).—Facts shown by the 1930 Federal census as to shifts in crop acreages, number and size of farms, farm tenancy, farm population, and workers in agriculture are presented in articles contributed by the Bureau of Agricultural Economics, as follows: Regional Shifts in Crop Acreage Shown by Census Have Been Extensive, by O. E. Baker (pp. 479–483); Regional Shifts Large in Major Crop Acreages during Decade 1919–1929, by J. A. Becker (pp. 484–487); Farms Fewer but Larger in 1930 than in 1920, Crop Area per Farm Increased, by H. A. Turner (pp. 487–491); Farm Tenancy Increased from 38.1 Per Cent of All Farms in 1920 to 42.4 Per Cent in 1930, by O. M. Johnson (pp. 491–495); Farm Population in Decade 1920–1930 Shows a Considerable Decrease, by C. J. Galpin (pp. 495–497); and Workers Gainfully Employed in Farming Decrease in Recent Years, by J. C. Folsom (pp. 498, 499).

Farm management in South Africa, E. S. Dawson ([*Johannesburg*]: *Central News Agency, 1931, pp. 338, pls. 15, figs. 7*).—The elements of farm economics are presented with a view to assisting prospective farmers in applying them to ordinary farm practices of the section.

Agricultural economics, C. Dragoni (*Economia Agraria. Milano: Ulrico Hoepli, 1932, pp. XXVIII+794, figs. 28*).—This is a general treatise on the subject with special reference to conditions, organizations, etc., in Italy.

Problems of the Pacific, 1931: Proceedings of the Fourth Conference of the Institute of Pacific Relations, edited by B. Lasker and W. L. Holland (*Chicago: Univ. Chicago Press, 1932, pp. XI+548, pl. 1, figs. 3*).—"This volume is a record of the round-table discussions . . . with extracts from the materials prepared for them and from addresses delivered at general sessions" of the conference held at Hangchow and Shanghai, China, from October 21 to November 2, 1931. The five parts deal with the economic relations in the Pacific, including changes in standards of living; China's economic development, including rural reconstruction; political relations in the Pacific; China's international relations; and cultural relations in the Pacific.

Present economic conditions as affecting agriculture, G. F. Warren (*N. Y. State Hort. Soc. Proc., 76 (1931), pp. 70–93, figs. 10*).—The causes of the present agricultural depression, its similarity to other depressions, etc., and remedies are discussed. Tables and charts included show the yield per acre of important agricultural crops during different periods, trends of production, the relation of farm prices, wholesale prices, retail prices, wages, purchasing power of wages, and cost of distribution, and of physical volume of production of agriculture, mining, and manufacturing, and the world production of gold.

A century of wages and earnings in agriculture, C. S. Orwin and B. I. Felton (*Jour. Roy. Agr. Soc. England, 92 (1931), pp. 231–257*).—Tables are included and discussed showing for different counties and districts of England the weekly cash wages of agricultural labor for different periods from 1824 to 1930. Other tables compare the minimum weekly wages and cost of certain items in the budget of workers and the purchasing power of wages in terms of wheat and beef. The standard of living of farm workers before and since the World War is discussed.

An experiment in the interpretation of farm profits, E. Whittaker (*Scot. Jour. Agr., 15 (1932), No. 3, pp. 320–329*).—Records from 12 low ground arable

sheep farms in the counties of Berwick, Roxburgh, and Selkirk for the crop year 1928–29 and 19 farms for 1929–30 are analyzed by the cross-tabulation method and the mathematical (linear regression equation) method.

The incidence of farming prosperity and depression, D. SKILBECK and M. MESSER (*Oxford: Univ. Oxford, Agr. Econ. Research Inst., 1929, pp. 31, figs. 2*).—This is a survey of conditions in England. Data were obtained by use of questionnaires regarding the number of changes in tenancy and demands for reductions in rent and for arbitration concerning rent under the Agricultural Holdings Act. Reports by counties are included.

A definite positive correlation was found between size of farm and number of notices to quit and demands for reductions in rent. There was also a tendency for the notices and demands to increase in frequency as the proportion of arable land increased. In the case of some commodities, such as milk and market garden stuffs, which, because of their perishable nature, are produced under naturally protected conditions, farmers taking advantage of such protection were found to be on a substantial basis. In the case of products, such as corn and meat, without natural protection or marketing advantages, competition was being successfully met by those farmers conforming to New World practices or occupying the better grade of land. Farmers not using hired labor on any considerable scale were able to meet conditions without difficulty.

The agricultural depression of 1931: Its nature and incidence, M. MESSER (*Oxford: Univ. Oxford, Agr. Econ. Research Inst., 1932, pp. 32, fig. 1*).—This is a continuation of the study noted above.

The percentage of notices to quit and demands for rent reductions increased from 0.07 for 1- to 24-acre holdings to 3.14 for 300- to 500+-acre holdings, and from 0.32 for holdings with from 0 to 30 per cent of the land arable to 0.95 for those with 70 to 100 per cent of the land arable. Other findings were that under present conditions farms with heavy clays or chalk soils, unless sown to grass, are most difficult to handle successfully; that stock farming is generally in a much more satisfactory condition than arable crop farming; that farmers producing for a sheltered market are still by no means depressed; that maintenance of rental values in some cases is being secured by landlords making outlays for seeds, fencing, buildings, etc.; and that efforts are being made to bring the cost of labor more in line with prices of products.

Our land use problem (*U. S. Dept. Agr. Yearbook 1932, pp. 457–478, figs. 9*).—The following articles contributed by the Bureau of Agricultural Economics on different phases of land utilization are included: Land-Utilization Problem, Intensified by Depression, Demands National Policy (pp. 457–460) and National Conference Recommends Program of Study and Action (pp. 460–462), both by L. C. Gray; Present Trends Indicate Farm Area of United States Not Likely to Increase Much, by O. E. Baker (pp. 462–467); Need of Better Directed Land Settlement Shown by Mistakes of the Past, by W. A. Hartman (pp. 467–470); Crops Occupy Nearly Half the Cultivable Acreage of the United States, by C. P. Barnes and F. J. Marschner (pp. 470–474); and Average Value per Acre of Farm Real Estate in United States Was $48.52 in 1930, by B. R. Stauber (pp. 474–478).

How to use farm credit (*U. S. Dept. Agr. Yearbook 1932, pp. 501–512, figs. 2*).—The amount, sources, and use of farm credit are dealt with in articles contributed by the Bureau of Agricultural Economics, as follows: Total Indebtedness of United States Farmers Estimated at 13 to 14 Billions, by N. J. Wall (pp. 501–503); Merchant Credit Important in Farm Finance, but May Help or Harm the Farmer, by D. L. Wickens and B. D. Seeley (pp. 503–505); Intermediate Credit Facilities Capable of Substantial Expansion, by N. J.

Wall and F. L. Garlock (pp. 505–507); Short-Term Credit Is Best Restricted to Productive Uses, by F. L. Garlock (pp. 507–509); and Mortgage Credit Use Requires Close Study of Long-Term Factors, by D. L. Wickens (pp. 509–512).

The farm tenant and his renting problem, O. R. JOHNSON (*Missouri Sta. Bul. 315 (1932), pp. 34, figs. 3*).—This bulletin presents extracts from the bulletin previously noted (E. S. R., 43, p. 190) and recently developed facts, figures, and principles regarding land renting in Missouri. Tables and maps are included showing the prevalence of tenant farming in the State in 1930 and the changes since 1920, by counties; the average size of farms, 1920, 1925, and 1930, and acres of crops harvested, 1925 and 1930; and the value of land and buildings and implements and machinery, 1930, on farms operated by owners, part owners, managers, and cash and other tenants. Other tables compare different items of investment, receipts, expenses, farm and labor incomes, etc., for farms operated by owners and tenants in three counties in 1928, 1929, or 1931. Cash, crop-share, cash-crop-share, and crop-livestock-share leasing, and the relation of rent to tenant's returns under different conditions as to yields, prices, etc., are described. Precautions to be observed in drawing leases are discussed, and typical forms for cash-rent, share-rent, and crop-livestock-share leases are included.

Freight rates and the South Dakota farmer, M. R. BENEDICT (*South Dakota Sta. Bul. 269 (1932), pp. 62, figs. 4*).—This is a nontechnical explanation of the nature of the farmer's freight rate problem, designed for the use of farmers, high school students, etc. Transportation as a phase of production, the dependence of commercial agriculture on railway transportation, the nature of railway costs and their relationship to class prices, how the present rate structure came to be, the effects of different types of rates, trends in rate levels, the problem of joint through hauls, what happens when rates are changed, the effects of a general rate change and of a general percentage change in all rates for a given product (potatoes), and the effects when rates on other products of the area are also affected are discussed.

To illustrate the effects of rate changes on production and prices, tables and charts are given and discussed showing the approximate relation of the U. S. supply of potatoes to potato prices at Cincinnati; the December 1 farm prices of potatoes, 1920–1929; the "normal" acreage and "normal" price and production of potatoes in the 12 potato areas of the United States in 1925; typical freight rates on potatoes in 1916 and 1925 in each of the 12 areas; and for each area the estimated production and price with the 1925 freight rates and immediately following a rate reduction to the 1916 rates when potatoes are at different prices from 76 cts. to $1.36 per 100 lbs. in area 2 (New York and Pennsylvania). The effects of rate changes on South Dakota products, elements in a rate policy for South Dakota, and means of protecting the State's interests in rate matters are also discussed. A brief history of the origin and organization of the South Dakota Board of Railroad Commissioners is appended.

The accuracy and flexibility of rural real estate assessment in Missouri, C. H. HAMMAR (*Missouri Sta. Research Bul. 169 (1932), pp. 68, figs. 6*).—This study grew out of the fact that the general property tax in Missouri, especially as applied to rural property, had become in many ways unsatisfactory.

It was found that property taxes on farm real estate have increased from $6,307,586 in 1914 to $18,060,851 in 1930, or an increase of from 18 to 53.5 cts. per acre. In the three years 1927, 1928, and 1929, more than 90 per cent of the local tax revenues were collected under the general property tax, while in the case of State revenues in 1928, only $6,430,440 out of a total of $34,057,036 was derived from the general property tax.

Ratios of assessed to sales values, determined from 2,451 transfers in 13 counties scattered over the State, varied from less than 20 per cent to more than 290 per cent. Accuracy of assessment of farm real estate varied greatly from county to county. Least accuracy was found in counties where sales values and physical conditions were most uniform, and greatest accuracy where conditions were diverse. Poorer soils were assessed at a higher ratio than better soils. Changes in assessments in Livingston County townships were made once about every two years between 1914 and 1931, but the number of changes in particular years varied from 8.1 per cent in 1915 to 99.3 per cent in 1918. Lags in assessed valuations tended to favor the owners of property the value of which was rising most rapidly, falling least rapidly, or rising when the value of other property was falling.

While farm real estate was underassessed in relation to city property between 1910 and 1920, it was heavily overassessed from 1921 to 1931. Lags in assessments heightened the land boom which ended in 1920, and, since that time, have contributed to the plight of Missouri agriculture. Lags in assessments favored the farmer when taxes were low, and penalized him when taxes were high.

Suggestions are made concerning a proposed reorganization of assessment procedure, including organization for more accurate assessments and the establishment of a system of supervision of assessments dealing directly with the problem of equalization. A plan for such a system is outlined.

[**County government**] (*Natl. Munic. Rev., 21 (1932), No. 8, pp. 469–524*).—This number is devoted to county government, and includes the following papers: Unrest in County Government, by H. P. Jones (pp. 469–472); Financing Governmental Services in Rural Areas, by P. W. Wager (pp. 473–476); People v. Empty Acres—A Problem in Rural Government, by P. H. Cornick (pp. 477–480); Rural Areas for Rural Government, by T. B. Manny (pp. 481–483); The County's Place in Large Urban Areas, by R. C. Atkinson (pp. 484–488); County Government and State Centralization, by K. H. Porter (pp. 489–492); North Carolina Centralizes, by P. V. Betters (pp. 493–498); The County, the Logical Public Health Unit, by M. E. Barnes (pp. 499–501); The Indiana Township—An Anachronism, by F. G. Bates (pp. 502–504); Planning for Improved County Government in Virginia, by R. H. Tucker (pp. 505–509); The Progress of County Consolidation, by J. W. Manning (pp. 510–514); Functional Realignment vs. County Consolidation, by C. H. Hammar (pp. 515–518); and The League's Committee on County Government, by J. A. Fairlie (pp. 519, 520).

A bibliography on county government, by I. Clement, is also included.

Contemporary agricultural law, A. J. Spencer (*Jour. Roy. Agr. Soc. England, 92 (1931), pp. 268–283*).—The acts of Parliament passed in 1931 and the court decisions affecting agriculture are discussed briefly.

Planning the farm business for the year ahead, P. A. Eke and E. T. Benson (*Idaho Sta. Bul. 188 (1932), pp. 36, figs. 5*).—The uses of a farm budget are discussed and the method of preparing such a budget is outlined and illustrated. Tables and charts are included showing the relative total costs, receipts, and farm income with two crop plans in 1929, 1930, and 1931, and with the same crop plan on 40-, 80-, and 120-acre farms in 1930 and 1931, and for cash crops, 1929, 1930, and 1931, on an 80-acre farm with different acreages of potatoes, sugar beets, and beans.

Other tables show a rotation plan for an 80-acre farm with dairy cattle; a sample budget for an 80-acre irrigated farm with dairy cattle; the acreages in potatoes in the 18 surplus States and the price of U. S. No. 1 potatoes at Idaho Falls, 1920–1931; the number of sheep, hogs, dairy cattle, and beef cattle

on farms in the United States and the Idaho farm prices of such livestock, 1900–1932; and the farm income, by years 1925–1931, on an 80-acre farm with 27 acres in potatoes and sugar beets and with three crop plans as follows: (1) 13.5 acres in sugar beets and 13.5 acres in potatoes each year, (2) the potato acreage increased or decreased in proportion to the average change in the potato acreage in Idaho, the remainder of the 27 acres being in sugar beets, and (3) the potato acreage increased or decreased 50 per cent according to whether the price outlook was favorable or unfavorable, the balance of the 27 acres being in sugar beets.

The computations used in budgeting crop acreages to fit certain rotations of crops and kinds of livestock are explained.

Farm mechanization (*U. S. Dept. Agr. Yearbook 1932, pp. 411–431, 433–455, figs. 19*).—Included are articles on the extent and effects of farm mechanization, as follows: Mechanization Slows as More Output and Less Demand Lower Prices, by C. L. Holmes and M. R. Cooper (pp. 411–414); Mechanization Affects Both Supply of and Demand for Agriculture's Products, by O. V. Wells (pp. 415–417); Mechanization Has Made Greatest Progress in the Great Plains Region, by L. A. Reynoldson (pp. 417–420); Corn Belt Increasing Its Output per Man in All Phases of Crop Growing, by W. J. Roth (pp. 420–423); Mechanization in Dairy Regions Increasing Fast, Investment Data Show, by E. Rauchenstein and T. D. Johnson (pp. 423–425); Machinery is the Best Means Yet Found for Controlling Corn Borer, by R. B. Gray (pp. 426–428); Mechanization in South Has Been Retarded by Lack of a Cotton-Picking Machine, by L. A. Reynoldson and B. H. Thibodeaux (pp. 428–431); Seed-Cotton Drying Proves Profitable; Two Types of Driers Used, by C. A. Bennett (pp. 433–435); Remediable Physical Condition of Farm Often Hampers Use of Machines, by G. R. Boyd (pp. 435–437); Tractor's Adaptation to Varied Farm Operations Rapid in Recent Years, by R. B. Gray (pp. 437–441); Tillage Implements of New Types and Designs Used in Modern Farming, by G. A. Cumings (pp. 441–445); Some Types of Harvesting Machinery Reach High State of Development, by W. M. Hurst (pp. 445, 446); Eroded and Terraced Farms Require Special Methods and Machinery, by C. K. Shedd (pp. 446–449); Rural Electrification Grows as Farmers Find New Uses for Electricity, by S. H. McCrory (pp. 449–453); and American Machinery is Influencing Agriculture Greatly in Other Lands, by R. B. Gray (pp. 453–455).

Hauling cane by wagon, G. H. Reuss (*Louisiana Stas. Circ. 4 (1932), pp. 16, figs. 5*).—This circular is based upon detailed records kept in 1931 on one plantation with 385 acres of cane and some supplementary data from two other plantations. Tables and charts show the relationship of tons hauled per hour to expenses per ton, of length of haul, size of load, variety of cane, and yield per acre to tons hauled per hour, and of unavoidable loader delay and length of haul and loss of wagon time.

Reducing costs of corn husking, P. E. Johnston (*Illinois Sta. Circ. 396 (1932), pp. 15, figs. 6*).—This circular is based on a study previously noted (E. S. R., 66, p. 185), supplemented by data for the year 1931. Tables are included and discussed showing the costs of husking by hand and with 1- and 2-row mechanical huskers. A form is given to assist the individual farmer in comparing costs on his own farm under existing conditions as to costs of man labor, horse work, machinery, gasoline, etc.

Survey of the wheat situation, April to July, 1931, August to November, 1931, and December, 1931, to March, 1932, M. K. Bennett et al. (*Wheat Studies, Food Research Inst. [Stanford Univ.], 7 (1931), No. 10, pp. [1]+477–525, figs. 6; 8 (1932), Nos. 3, pp. [1]+199–260, figs. 18; 7, pp. [1]+377–407, figs. 7*).—These studies are a continuation of the series previously noted (E.

S. R., 65, p. 681). Each discusses the international trade in wheat, the supply position, movements in wheat prices, and the outlook. The new-crop developments are also discussed in No. 10; governmental measures affecting wheat and the marketing and disposition and stocks of wheat in No. 3; and wheat consumption, 1931–1932, in No. 7.

The grape industry: A selected list of references on the economic aspects of the industry in the United States, 1920–1931, compiled by V. E. Hitz (*U. S. Dept. Agr., Bur. Agr. Econ., Agr. Econ. Bibliog. 36 (1932), pp. II+161*).—This is a mimeographed selected list of references on the economic phases of the grape industry in the United States, 1920–1931. Raisins, currant grapes, and a few grape products are included.

Seven years' pig-keeping: A statistical record, J. H. Smith and J. W. Reid (*Jour. Min. Agr. [Gt. Brit.], 39 (1932), No. 4, pp. 322–332*).—This article deals with the production and financial results at the Hertfordshire Institute of Agriculture from April 1, 1923, to March 31, 1930.

An analysis of the East Bay milk market, J. M. Tinley and M. H. Blank (*California Sta. Bul. 534 (1932), pp. 110, figs. 10*).—This bulletin presents the results of a study made by the Giannini Foundation in 1931, at the request of the dairymen's and milk dealers' associations of the area, of the milk market of the East Bay area and San Francisco. Tables and charts are included and discussed showing the demand for market milk, the quality of such milk, sanitary regulations, the supply area, buying prices and their relation to production, transportation to city plants, distribution of milk, distributors' margins, and the methods for establishing prices. The agreement between the Cooperative Dairymen's League and individual distributors is given.

Recommendations are made that consumer demand be stimulated by educational work and advertising; that effort be made by distributors to reduce distribution costs; that buying and resale prices be adjusted from time to time more closely in line with the costs of the more efficient distributing firms; that an agency be established to collect data and analyze the economic factors influencing production, distribution, and consumption, to study means of effecting economies in marketing, and to meet at least once each three months with representatives of producers and distributors to decide on buying and resale prices; that the Cooperative Dairymen's League take the leadership in raising the quality of the milk and disseminating information; and that nonmembers of the league be required to contribute to its upkeep on the same basis as members.

Principles of marketing, F. E. Clark (*New York: Macmillan Co., 1932, rev. ed., pp. XV+657, figs. 27*).—This revision of the work previously noted (E. S. R., 48, p. 788) consists "largely of more thorough analysis of fundamental problems and principles and the addition of factual data and illustrations."

The Agricultural Marketing Act, 1931 ([*Gt. Brit.*] *Min. Agr. and Fisheries, Econ. Ser. 33 (1931), pp. 104*).—This report explains the act (21 and 22 Geo. 5, Ch. 42) and offers guidance in the study of the more important provisions. Appendixes include the text of the act, the Tribunals of Inquiry (Evidence) Act, 1921, and extracts from other related legislation.

The marketing of Northern Ireland agricultural produce (*Belfast: North. Ireland [Min. Agr.], 1932, pp. III+159, pls. 11*).—This is a report on inquiries into the conditions and methods of marketing Northern Ireland agricultural produce, carried on under a grant from the Empire Marketing Fund. A general report (pp. 3–39) describes and discusses the origin of markets and fairs, the markets in Northern Ireland, market tolls, the decline and future of markets, and marketing reform. Special reports discuss the marketing of cattle, of pigs, of fat and store lambs, of poultry, and of turkeys.

Report on the organization of potato marketing ([*Gt. Brit.*] *Min. Agr. and Fisheries, Econ. Ser. 34 (1931), pp. VI+175, pls. 3, figs. 20*).—This is the first of a series of reports dealing with the possibilities of organization for the marketing of different agricultural products. The production and utilization of the crop in England and Wales, the imports and exports of the United Kingdom, the marketing methods and recent developments therein in England and Wales, the marketing organizations and regulations in the United States, Canada, Belgium, the Netherlands, Germany, Tasmania, and other countries, and the disposal of surplus supplies are discussed. Structural and functional analyses are made of the overseas marketing organizations and of the problems of reorganization of the marketing systems of the United Kingdom. A plan of development for such reorganization is outlined.

Marketing Virginia tobacco, R. A. Ballinger and J. L. Maxton (*Virginia Sta. Bul. 285 (1932), pp. 55, figs. 6*).—This study was made in cooperation with the Bureau of Agricultural Economics, U. S. D. A. Tables are included showing, by census periods 1869–1929 for the United States, the acreages of tobacco other than cigar types, by States; the acreages and yields of tobacco in different countries, 1928–29 to 1930–31; the United States imports of leaf tobacco, 1926–27 to 1930–31; the United States exports of tobacco, by types, 1923–24 to 1930–31; the annual value of exports, by kinds, 1925–1931; the tobacco import duties in different countries, 1931; the United States duties on different classes of tobacco under the 1909, 1913, 1922, and 1930 tariff acts; Federal internal revenue receipts from tobacco and other sources, by years 1925–1931; and the quantities of leaf tobacco used in the United States for manufacturing cigars, cigarettes, and tobacco and snuff, by years 1921–1930.

The tobacco industry in Virginia, including changes in acreages and prices, the curing and sorting on farms, auction warehouse marketing, and the tobacco boards of trade are described. Tables and charts are included and discussed showing the distribution of the sales, by months, and the average monthly prices paid at Virginia tobacco markets during the 1929–30 and 1930–31 crop years, the charges at different markets for selling tobacco, and the average prices in Virginia during the 1930–31 marketing season for different grades of United States types 11 and 21.

Using the reports from 37 warehouses in 1929–30 and from 28 in 1930–31, analysis is made of the cost of operation—total and per 100 lbs. of tobacco—of the flue-cured and fire-cured warehouses, the relative costs for owned and rented warehouses, and the profitableness of warehouse operation. The method and costs of redrying tobacco are discussed, and suggestions are made for improving the marketing of tobacco in Virginia.

Marketing cannery tomatoes on grade in Ohio, C. W. Hauck (*Ohio Sta. Bul. 504 (1932), pp. 30, figs. 8*).—This is a study of the costs and returns to growers and canners where tomatoes were bought on grade rather than on a flat rate, special attention being given as to what are equitable prices for different grades of tomatoes. It is based chiefly on data obtained regarding deliveries to 7 stations in 1930 and 14 stations in 1931 at which tomatoes were purchased on grade. The tomato canning industry in the United States and Ohio, the United States grades for tomatoes, and the inspection process used by the factories studied are described.

Tables and charts are included and discussed showing the distribution, by grades, of the tomatoes purchased at each of the 21 stations; the returns for the deliveries at the 7 stations in 1930, as compared with estimated returns at the usual flat rate; the returns to 5 growers in 1930 on the grade basis compared with their average returns, 1925–1929, on the flat rate basis; the yields and values of different grades of canned tomatoes and other products and the

waste at 5 factories buying on grade in 1930, as compared with the averages, 1925–1929, when the factories were buying on a flat rate; and the contract prices for United States No. 1 and United States No. 2 tomatoes paid by the 21 stations. Other tables show for canning experiments made in 1931 with No. 1 and No. 2 tomatoes the number of cans of different grades, other products, and waste, the scores of sample cans of the different grades, and the relative yields and values of a ton of No. 1 and of No. 2 tomatoes. Results of experiments to determine the deterioration of No. 1, No. 2, and cull tomatoes during the periods of 15 to 39 hours are given.

Graded tomatoes in 5 factories in 1930 yielded 34.8 per cent canned tomatoes, 18.4 per cent other products, and 46.8 per cent waste, as compared with 28, 19.7, and 52.3 per cent, respectively, for the period 1925–1929 when buying was on a flat basis. The percentage of fancy and extra standard grades in the pack increased from 48.2 to 58.1 of the total pack, and that of standard grade decreased from 10.4 to 7.4. The 1930 growers received $1.38 per ton more on the grade basis than they would have received on the flat rate basis. The gross sales value of manufactured products was $7.86 per ton more for raw stock purchased on a flat basis. The additional costs per ton of manufacturing raw stock on the grade basis were for raw stock $1.38, inspection 31 cts., cans $2.04, and labor costs 28 cts. less, leaving a net gain to the canner of $4.41 per ton. The 1931 experimental work showed the pack from United States No. 1 tomatoes was worth about $5 more per ton than that from United States No. 2 tomatoes. Tomatoes held 1.5 days after delivery shrank 5.5 per cent in weight and declined so seriously in grade as to be almost unfit for use.

Report on the marketing of sheep, mutton and lamb in England and Wales ([*Gt. Brit.*] *Min. Agr. and Fisheries, Econ. Ser. 29 (1931), pp. 186, pls. 35, figs. 9*).—The systems of flock management, breeds of sheep, and types of mutton and lamb are briefly described. The home production and imports of sheep and of mutton and lamb, the demands and prices for store and fat sheep and mutton and lamb, and the market intelligence in England and Wales, the United States, and Germany are discussed. Other sections of the report discuss the flow to market of sheep and lambs, market classes and grades, method and basis of sales by producers, the operations of livestock traders, organized marketing by producers in the United States, Canada, and New Zealand and the possible developments of such marketing in England and Wales, slaughtering and dressing, carcass quality factors, carcass grading, the wholesale and the retail trades, transportation, and the sale and use of offals and by-products.

Report on the organization of wool marketing ([*Gt. Brit.*] *Min. Agr. and Fisheries, Econ. Ser. 35 (1932), pp. 149, illus. 30*).—This is the second report in the Economic Series on wool marketing (E. S. R., 57, p. 190). A general description is included of sheep husbandry, the wool textile industry, and the production, consumption, and prices of wool in England and Wales and other countries. More detailed consideration is given the methods of assembling and selling the home clip through farm sales, country brokers, country auction sales, and cooperative associations. Central auction selling in Australia, New Zealand, and South Africa and cooperative societies operating on a national basis in the United States and Canada are discussed. A reorganization of the marketing services of England and Wales is discussed under the headings of assembly, preparation for market, sales methods, processing, credit, and other services. Plans for improving the marketing of wool in England and Wales are outlined.

The fluid milk market in England and Wales, R. B. Forrester ([*Gt. Brit.*] *Min. Agr. and Fisheries, Econ. Ser. 16 (1927), pp. VIII+141, figs. 38*).—The magnitude, localization, and variation of supplies; the centers of con-

sumption and their sources of supplies; the factors affecting assembling and transportation; the quality of the supplies, standards and tests of quality, and the graded milk movement; producers' prices and collective bargaining; the distribution of milk; consumers' markets; and the outlook in the fluid milk market are discussed.

Report on the marketing of dairy produce in England and Wales.—Part II, Butter and cream ([*Gt. Brit.*] *Min. Agr. and Fisheries, Econ. Ser. 30 (1932), pp. 152, illus. 56*).—This is the third bulletin of the series dealing with the marketing of dairy products (E. S. R., 65, p. 386); the second being noted above. Included are preliminary surveys of the supplies of, demand for, and prices of butter and cream. The quality characteristics, effects of the system of production, systems of quality control, standardization, packing and wrapping, country wholesaling, organized marketing, the wholesale and retail trades, statutory requirements as to weight and quality, transportation, and storage of butter, and the quality characteristics, statutory requirements, packing, transportation, and wholesale and retail trades for cream are discussed.

Relation of grade and staple length of cotton to prices received by farmers in local markets of Arkansas, J. G. Maddox (*Arkansas Sta. Bul. 274 (1932), pp. 76, figs. 6*).—The results are reported of a three-year study, made in cooperation with the Bureau of Agricultural Economics, U. S. D. A., of the relation of cotton grade and staple length to prices received by growers in representative local markets of Arkansas. Procedure and method of data analysis are explained.

It is stated that, though prices paid by mills bear a rather definite relation to grades and staples, no such relationship is found between price and quality in the local or farmers' markets; that on a given day in a local market, "growers received little if any higher prices for cotton of high grade and long staple length than for relatively low grade cotton of short staple."

Factors indicated as influencing the prices paid to farmers include differences in classification as practiced by government classers and local buyers, and weaknesses of farmers' bargaining power. Local buyers are more dexterous bargainers than the farmers from whom they buy cotton.

The bargaining power of the growers is strengthened when their cotton is sold on the basis of government standards, as in the case of cooperative marketing. Local marketing practices may be improved and the bargaining power of growers strengthened by technological researches designed to determine more tangible and definitely described standards of quality, by giving the farmers the benefit of a better classification service, and by improving their general knowledge of cotton quality in relation to prices.

Relation of daily prices to the marketing of hogs at Chicago, H. J. Stover (*New York Cornell Sta. Bul. 534 (1932), pp. 97, figs. 109*).—This study analyzes for the years 1910–1913 and 1921–1928 the relationships existing between daily prices, receipts, and other factors at the Chicago hog market, special attention being given to price and supply variations, supply-price relationships, and supply responses to price fluctuations under varying conditions. It is based chiefly on data on daily top and average prices, receipts, and reshipments taken from the Chicago Daily Drovers Journal, Yearbook of Figures and supplementary information relative to the hog market furnished by the Bureau of Agricultural Economics, U. S. D. A.

The average percentages of weekly receipts, 1921–1928, received on different days were on Monday 29.5, Tuesday 18.3, Wednesday 12.5, Thursday 20.1, Friday 16.1, and Saturday 3.5. The average percentages of receipts reshipped were 26.6, 18, 11.6, 17, 20.4, and 6.4 on the respective days, and the average percentages of receipts remaining for slaughter on the respective days were

30.5, 18.5, 12.8, 21.2, 14.5, and 2.5. Weekly receipts were much more unevenly distributed before the war. Percentages of receipts reshipped and prices paid on different days varied with the price cycle and season of the year. Both average and top prices averaged highest on Monday. Average prices were lowest on Wednesday and Saturday. Daily changes in prices were greatest from Saturday to Monday and least from Friday to Saturday. Both top and average prices fluctuated about 1.25 per cent from day to day. Most changes from one day to the next were 25 cts. or less per hundredweight. The most frequent change from Saturday to Monday was a 15-ct. advance, and that from Tuesday to Wednesday a 10-ct. decline. Top and average prices fluctuated most nearly together from Saturday to Monday, and least nearly from Friday to Saturday. Receipts on Monday varied least, and those on Saturday most.

Adjustment of prices to receipts was greatest on Wednesday and least on Saturday. In general, the more variable the day's receipts the less the adjustment of prices to receipts. Adjustment of prices to receipts for the week as a whole was greater than for any single day. Adjustment of prices to receipts on Thursday was greater before than after the war, at the top than at the bottom of the price level, and in the summer than in the winter months.

Prices changed more with fluctuations in receipts on Monday and Thursday than with receipts on other days, and least with fluctuations in Saturday's receipts. On all days, price advances stimulated shipments to market, and price declines retarded shipments. Except in price changes from Friday to Saturday, the greatest effect on receipts of price changes was on the third day after the change. The greatest effect was the response of Saturday's receipts to price changes from Tuesday to Wednesday. There was no significant difference in the effect of changes of top and average prices on receipts. The same absolute change in prices was nearly twice as effective on later receipts before than after the war. Price changes affected later receipts more at the top of the price cycle than at the bottom, more in the winter than in the summer, more when the spread between top and average prices was small than when large, and more when the direction of change was opposite to the trend in prices. One day's change in prices affected receipts less than changes in the same direction on two successive days, but more than changes in the same direction on three or more successive days. On all days, an advance in price over the preceding day was accompanied by an increase in the percentage of receipts reshipped on that day, and a decrease in the percentage reshipped three days later. In general, the percentage of receipts reshipped tended to fluctuate inversely with the number of hogs received.

Following price advances at Chicago there was more tendency to reship when the level of prices was high. Price advances on two successive days stimulated reshipment from Chicago more than did an advance in prices following a decline. On all days of the week, changes in prices from one day to the next were followed by further changes in the same direction on the following day, the change in the opposite direction taking place from the second to the third day.

Price differences between four hog markets used by Illinois stockmen, L. J. Norton and R. C. Ashby (*Illinois Sta. Bul. 380 (1932), pp. 121–154, figs. 4*).—This bulletin is based on price data for the period 1926–1930, compiled by the U. S. Department of Agriculture for the Chicago, East St. Louis, Indianapolis, and Cincinnati markets, and data obtained by visiting each of these markets in October, 1930, and January and June, 1931. The factors influencing the choice of markets, the nature of each market, and the quotations at each market are discussed. Comparisons are made of annual, seasonal, monthly, and daily prices at Chicago, East St. Louis, and Indianapolis, and at

Cincinnati, Indianapolis, and East St. Louis during the period studied, special attention being given to the periods covered by the special visits. Comparison is also made of the monthly prices in 1931 of medium weight and light weight hogs on the East St. Louis, Chicago, and Indianapolis markets. Some suggestions are made as to the methods of reducing the intermarket variation in prices.

On the basis of quality and finish of hogs received, Indianapolis rated first and Chicago last, with little difference between the other two markets. At all the markets a large percentage of the hogs graded good or better. Indianapolis was the most exacting and Chicago the least exacting in the matter of sorting. Prices were highest at Cincinnati and next highest at Indianapolis. No great difference existed between Chicago and East St. Louis. Considerable variability in daily prices existed between all the four markets. There was a distinct seasonal variation in price differences between East St. Louis and Chicago, the prices at the former being lower in the spring, late summer, and early fall and higher in the other months. No definite seasonal variation was found between Indianapolis and either East St. Louis or Cincinnati.

Relation between egg quality and price, A. H. LINDSEY and H. W. YOUNT (*Massachusetts Sta. Bul. 282 (1932), pp. 22, fig. 1*).—Samples of eastern and western eggs were purchased from selected stores, chain and private, in Springfield, Worcester, and Boston in November, 1928, and in the metropolitan area in and around Boston in April and August, 1929. The samples were scored on external quality factors—appearance, color, number broken, cracked, and leaking, weight per dozen, and range in weight; and on internal factors—shrinkage, condition of yolk and white, and inedibility. Tabular analyses were made for each month of the relation to price of the external and internal scores for fresh and storage eggs handled by private and chain stores. Correlation analyses were also made of the relations between price and (1) external quality factors exclusive of weight and (2) internal quality factors and weight.

Prices and weight were related under practically all conditions. The combined effect of all factors was most significant in August and least significant in April. Weight was most significant in August and least in November, air space most significant in November and least in April, condition of yolk most significant in April and least in November, and condition of white most significant in August and least in April. Average quality varied with price throughout the lower and middle price ranges only. Because of the wide range of quality within each price range, price could not be used as a criterion of quality. Dirty eggs affected price more than variations in color within each dozen. Range of weight within each dozen had very little relation to price. The average quality of eggs was higher for eastern than for western eggs. Quality and weight varied as widely in relation to price for labeled as for unbranded eggs.

Crops and Markets, [August, 1932] (*U. S. Dept. Agr., Crops and Markets, 9 (1932), No. 8, pp. 273–320, figs. 3*).—Included are (1) estimates of the condition of different crops on August 1, 1932, and of the prices received by producers, July 15, 1932, for different crops, livestock, and livestock products; (2) the July, 1932, dairy, sheep, wool, and poultry and egg outlook reports; (3) market reports for livestock and livestock products, dairy and poultry products, fruits and vegetables, hay, feed, and seeds, grains, and cotton; (4) report of the cold storage holdings, August 1; (5) a summary of the price situation as of August 15, 1932; and (6) data as to movement of population to and from farms in 1930 and 1931.

Agricultural statistics (*U. S. Dept. Agr. Yearbook 1932, pp. 573–954*).—This section, prepared by the statistical committee of the Bureau of Agricultural Economics, covers the year 1931. It is somewhat reduced both in number of tables and periods covered from the section noted for the preceding year (E. S. R., 65, p. 486), but the most important agricultural statistics for the United States and for the world, so far as the agriculture of the United States is concerned, are included. Grains, cotton, sugar, tobacco, fruits, vegetables, miscellaneous crops, different kinds of livestock, dairy and poultry products, foreign trade in agricultural products, farm business, and miscellaneous items are covered. Historical and geographical series are given.

Ohio agricultural statistics for 1929–1930–1931, A. R. Tuttle, R. E. Straszheim, and P. P. Wallrabenstein (*Ohio Sta. Bul. 503 (1932), pp. 58, fig. 1*).—This bulletin, prepared in cooperation with the U. S. D. A. Bureau of Agricultural Economics, is based on the reports of the Federal-State Cooperative Crop and Livestock Reporting Service. Tables are included showing (1), by counties, the acreage, yield per acre, and production of crops, 1929, 1930, and 1931, and the estimated number of livestock of different kinds on farms, January 1, 1930, 1931, and 1932; (2) the acreage, yield, production, farm price, December 1, and total value of important crops in the United States, 1929, 1930, and 1931, and in Ohio, by years 1919–1931; (3) the farm prices of crops in Ohio, by months 1927–1931; (4) the number of livestock of different kinds on farms in the United States on January 1, 1920–1932; (5) the number of head, value per head, and total value of different kinds of livestock on Ohio farms, January 1, 1920–1932; and (6) the monthly prices, 1927–1931. Other tables show the average monthly prices, 1927–1931, of milk, butterfat, country butter, wool, chickens, and eggs; by districts, by months 1929–1931, the average daily production of milk per cow and the average number of eggs produced per 100 hens; the farm prices on December 15, 1927–1931, of different agricultural products; and the average farm wages, 1929–1932.

Some data are also included on maple sugar; oats shipped out of the county where grown and remaining on farms; potato prices in leading potato States; monthly receipts of livestock at public stockyards from Ohio farms, 1929–1931; sows bred and farrowed and pigs saved; sheep killed or injured by dogs; etc.

The co-operative organization in British India, B. G. Bhatnagar (*Allahabad: Ram Narain Lal, 1927, pp. V+321+XIV*).—This is a description and discussion of the history, organization, and development of cooperative organization in India, and of the banks, societies, and other cooperative agencies dealing with credit, purchasing of supplies, production and marketing of commodities, housing, and agricultural improvement.

Membership relations in community organizations: A study of factors affecting organizational attitudes, W. E. Garnett and A. C. Seymour (*Virginia Sta. Bul. 287 (1932), pp. 63, figs. 26*).—This is the fifth bulletin in the series previously noted (E. S. R., 65, p. 391) and was prepared in cooperation with the Bureau of Agricultural Economics, U. S. D. A. It analyzes data obtained by field workers from adult members of 636 families regarding a parent-teacher association, two granges, a community league, and a community association in four counties. The four types of organizations and the different communities and the organizational histories thereof are described.

Tables and charts show for each community the membership in different kinds of organizations, the number and percentage of households belonging to different numbers of organizations, and the membership relations by tenure.

Other charts and tables show the relation to community organization of occupation, years in the community by tenure groups, distance to meeting place, size of family, age by tenure groups, education, time spent in reading, number of periodicals subscribed to, radio ownership, and motion picture show attendance. The attitude of the people to organizational activities and policies are discussed, with tables summarizing replies regarding number of organizations and meetings believed desirable, adequacy of present organizations, and one inclusive v. several special interest organizations and family type v. special age organizations.

Among the conclusions reached are that (1) even in well-developed communities with long established community organizations, as a whole active support is given by less than one-third of those whose support is sought; (2) the larger portion of the membership resides within two miles of the community center; (3) a high standing in environmental factors, especially those of a more cultural character, is closely associated with a high degree of organizational membership; (4) social stratification affects the strength of all types of organizations studied; (5) one meeting per month and the inclusive type of organization were preferred; and (6) the majority of those interviewed were fairly well satisfied with prevailing organizational conditions, activities, and accomplishments, except for means of meeting marketing needs.

An appendix includes a table of coefficients of contingency of the relation of membership in community organizations to various factors.

A study of agricultural populations in selected Vermont towns, G. LAMSON (*Burlington: Vt. Comn. Country Life, 1931, pp. [2]+69, pls. 3, figs. 7*).—A study was made of 7 towns representative of 5 types of agricultural communities. The data were gathered by visits to practically every farm; consultations with merchants, bankers, teachers, and town officers; and attendance at meetings and interviews with officers of the farm bureau and others farmers' organizations. The areas and the agricultural population thereof are described. The movement of the agricultural population, farm economy, the consolidation and assimilation of foreign-born groups and their contributions to the agricultural population, and the problems and needs of the areas are discussed.

The pressure of population: Its effects on rural economy in Gorakhpur district, [India], J. K. MATHUR (*[United Provs. Agra and Oudh, Dept. Agr.] Bul. 50 (1931), pp. [IX]+55, pls. 4*).—The population growth, the problems arising out of toy-holdings, the increase of agricultural laborers, movements of prices and wages, livestock, and emigration, progress in irrigation, double cropping, rural housing, and standards of life are discussed.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

The Superior School of Agricultural Cooperation, Praha, Czechoslovakia (*L'École Supérieure de la Coopération Agricole, Prague, Tchécoslovaquie. Praha (Prague), 1931, pp. 38, pls. 3*).—The organization and curriculum of the school are described.

Mathematics in agriculture, H. B. ROE (In *The National Council of Teachers of Mathematics Sixth Yearbook. New York: Bur. Pubs., Teachers Col., Columbia Univ., 1931, pp. 86–101; abs. in Minnesota Sta. Rpt. 1931, pp. 42, 43*).—This is Miscellaneous Paper No. 226 of the University of Minnesota, Department of Agriculture. It discusses the breadth of mathemetical knowledge and training needed in the field of agriculture.

Modern agriculture, W. E. GRIMES and E. L. HOLTON (*Boston and London: Ginn & Co., 1931, pp. VII+632, pls. 2, figs. 375*).—This is a thorough revision of Waters' Essentials of the New Agriculture (E. S. R., 51, p. 693). Obsolete material has been eliminated, new material added, and the subject matter rearranged and organized into 20 teaching units with from 2 to 27 problems under each unit.

Food preparation studies, A. M. CHILD, K. B. NILES, and A. KOLSHORN (*New York: John Wiley & Sons; London: Chapman & Hall, 1932, pp. VI+156, fig. 1*).—"The plan followed in this volume is a departure from the usual method of teaching food preparation. The facts and principles are given, but the definite applications are to be filled in by the student. The teacher's problem is to see that the student understands the principles as they apply to desirable methods of food preparation. A knowledge of some science is essential. If the student does not possess this important background it will be necessary to secure it while the food-preparation course is in progress."

The subject matter is arranged in a series of studies, each dealing with a particular food group (such as fruits, vegetables, etc.) or a particular food process (such as batters and doughs). Following each study, or in some cases groups of studies, are sections dealing with the facts and principles related to the group or groups. These are listed in columns, with blank columns opposite for recording the various applications. An appendix contains useful suggestions to teachers, menus, a discussion of judging food products with score cards for muffins, jelly, baked potatoes, crisp molasses cookies, griddle cakes, and cakes, a tabulation of basic proportions and substitutions for different types of food preparations, temperature regulations, unit measures of foods, and classified references to the literature.

Meat demonstrations increase interest in supplying home needs, R. W. SNYDER (*U. S. Dept. Agr. Yearbook 1932, pp. 556–558, figs. 3*).—The activity of the U. S. D. A. Bureau of Animal Industry cooperating with the Texas Agricultural Extension Service in demonstrating the killing of hogs, cattle, and lambs and preparing meat products from these animals on the farm is discussed in this article.

A milk-quality improvement program for extension workers, C. J. BABCOCK and J. B. PARKER (*U. S. Dept. Agr., Misc. Pub. 148 (1932), pp. 18*).—A program is outlined for organization and cooperation in milk quality improvement work. Essential rules and practices in producing high quality milk, some methods of determining quality, a dairy farm score card, and lists of Department publications, film strips, motion pictures, and blue prints helpful in the work are included.

Milk-quality improvement program for 4-H dairy clubs, C. J. BABCOCK and J. B. PARKER (*U. S. Dept. Agr., Misc. Pub. 146 (1932), pp. 20, figs. 6*).—A program covering a year's work in 12 meetings is outlined. Most of the meeting programs include notes for leader's discussion of the subject covered.

FOODS—HUMAN NUTRITION

Food-composition data aid research workers to interpret food standards, C. CHATFIELD (*U. S. Dept. Agr. Yearbook 1932, pp. 565*).—A brief explanation is given of the service of the Bureau of Home Economics in collecting and disseminating information on the chemical composition of foods.

Chemical composition of certain kinds of sausage and other meat food products, R. HOAGLAND (*U. S. Dept. Agr. Circ. 230 (1932), pp. 10*).—Proximate

analyses by the Official method, together with fuel values in calories per pound, are reported for a considerable number of samples of the same class of meat products for which protein analyses were reported previously (E. S. R., 62, p. 391). The materials, which were obtained from seven Government-inspected establishments located in a number of the more important meat-packing centers, included first- and second-grade Frankfurter-style and Bologna-style sausage and both of these types of sausage with cereal; pure pork, fresh link, Braunschweiger-style, liver, blood, Polish-style, and country sausage; head-cheese; meat loaf; souse; luncheon roll; and bockwurst and, for comparison, medium fat beef chuck and pork-loin chops.

Recent developments in the science of cooking, E. G. Halliday and I. Noble (*Jour. Amer. Dietet. Assoc., 8 (1932), No. 1, pp. 1–24*).—About two-thirds of this literature review is devoted to recent developments in the science of meat cookery, including objective methods of judging quality in terms of tenderness and color, subjective methods of judging quality, standardized methods for cooking beef, pork, lamb, and veal, and the effect of cooking on the digestibility of meat. The other topics discussed more briefly are cereals, starch gels, factors which affect the gelation of pectin, and batters and doughs. A list of 57 references to the literature is appended.

Definitions of terms used in meat cookery, I. S. Willson (*Jour. Home Econ., 24 (1932), No. 2, pp. 129–132*).—This contribution from the subcommittee on methods of cooking of the Committee on Cooperative Meat Investigations consists of definitions of terms used in meat cookery as adopted at the August, 1931, conference of the cooperators in the national project.

A method for measuring the relative plasticity of pastes and doughs, C. H. Bailey (*Jour. Rheol., 1 (1930), No. 4, pp. 429–432, figs. 3; abs. in Minnesota Sta. Rpt. 1931, p. 24*).—The principle of the method described consists in measuring the plasticity of the paste or dough in terms of the work expended in operating a dough-mixing machine. The apparatus consists essentially in a motor-driven dough mixer provided with a watt-hour meter for measuring the work input required to move the blades of the mixing machine a unit distance through the dough.

Comparative cooking qualities of domestic rices, M. C. Stienbarger (*Cereal Chem., 9 (1932), No. 3, pp. 317–322, figs. 3*).—In this study at the Bureau of Home Economics, U. S. D. A., of the comparative cooking qualities of the more widely grown domestic varieties of rice, the observations included the percentage of moisture in the uncooked rice, the size of the uncooked and cooked grains, the time required to cook to tenderness, the presence of hard centers, the amount of water absorbed during cooking, the color of the cooked rice, and the amount of starch in the cooking water. The time for cooking to tenderness was taken as the time required to cook the grains by boiling gently in an excess of water until they could be crushed between the thumb and finger. After the samples were cooked to tenderness they were drained and washed with cold water to separate the grains.

Considerable differences were shown by the various samples in the cooking time and the color, appearance, and tenderness of the cooked product. The varieties tested in decreasing order of desirability were Rexoro, Honduras, Fortuna, Blue Rose, Calora, Edith, Lady Wright, and Early Prolific. It is thought that rice should be sold by variety name and grade rather than as a mixture of different varieties on account of the difference in time required to cook the different varieties.

Bone building potency of soy bean diets, S. C. Chen and W. H. Adolph (*Chinese Jour. Physiol., 6 (1932), No. 1, pp. 59–62*).—In this comparison of the bone-forming properties of cow's milk, soybean milk, and soybean curd, 10

c c of the milk, 15 c c of the soybean milk, and 8 g each of two varieties of soybean curd (quantities considered comparable on the dry basis) were fed daily for a period of 5 weeks to rats on the McCollum rickets-producing ration 3143. At the end of the period the rats were killed, the tibias examined by the line test, and the femurs analyzed for ash.

As determined by both of these criteria, the soybean products were distinctly inferior to the cow's milk. Soybean milk appeared to be slightly superior to soybean curd. These results are thought to confirm the opinions expressed by Tso (E. S. R., 60, p. 492) and others that soybean milk does not prevent rickets, and that when used for infant feeding it should be supplemented with both calcium and vitamin D.

Type, variety, maturity, and physiological anatomy of citrus fruits as affecting quality of prepared citrus juices, A. F. Camp, H. P. Traub, L. W. Gaddum, and A. L. Stahl (*Florida Sta. Bul. 243 (1932), pp. 56, fig. 1*).—This is a detailed report of preliminary data obtained in an extensive investigation conducted cooperatively by the station and the Bureau of Plant Industry, U. S. D. A., on factors affecting the quality of prepared citrus fruit juices.

The methods of extraction included (1) a control method, in which great care was taken to remove as much as possible of the material from tissues other than juice sac tissues and to allow no metal to come in contact with the juice except the blades of stainless steel knives used in paring and sectioning, and three commercial methods, in which (2) the juice was pressed from the halved fruits by means of an inverted aluminum cup which holds the halved fruit and presses it against a metal form having the same shape as the cup holding the fruit, (3) the juice was pressed from the whole peeled fruit by means of a conical worm in a conical fluted housing, and (4) the pulp was reamed out on a high speed revolving cone. In all cases the juice was run through a tinned wire strainer into a glass receptacle from which it was transferred to a glass vacuum flask for 2 or 3 minutes and then placed in 8- or 10-oz. jelly glasses and capped under vacuum with lacquered caps. Some of the samples were frozen in rapidly circulating brine and then stored at 0° F. and others stored without freezing at 32°. The defrosting was done by immersing the containers in running tap water. The juices when freshly extracted and after various periods of storage were analyzed for pH, total soluble acids, total sugars, and other physicochemical characteristics and judged for taste and color.

The factors studied and general findings have been noted previously from another source (E. S. R., 67, p. 639). Concerning the relative merits of the three commercial types of extractors used, juice extracted by method (2) did not develop bitterness, while those extracted by (3) and (4) developed a bitter taste after 2 hours and became exceedingly bitter after 4 hours. Marked changes in the color of the juice occurred only with method (2), the most satisfactory from the standpoint of taste. The most rapid settling of suspended particles occurred with method (3) and the least rapid with method (4), while with method (2) there was little or no settling during the first hour or so after standing. After from 2 to 4 hours the rates of movement of the particles were similar for all methods of preparation.

In discussing the suitability of types and varieties of citrus fruit for juice extraction, the authors state that the results reported are "a mere beginning toward the thorough description of citrus varieties suitable for juice production on the basis of glucoside content and other constituents and the relative proportions of these remaining at various stages of maturity. The subject is of major importance and will require numerous comprehensive experiments to determine the best varieties for juice purposes and the optimum stage of maturity."

Of particular importance as regards color and stability is the correct proportion of citrus oil. "The subject of the relative amounts of citrus oil required to obtain a given color effect is of importance not only to those choosing a method of preparation already available, but also to those interested in the design of improved machinery for juice preparation." It is noted, however, that the color factor is secondary to taste, and that the amount of citrus oil used in every case must be considered from the standpoint of agreeableness in the taste of the product.

A list of 44 references to the literature is appended.

[Freezing to preserve vegetables and fruits] (*U. S. Dept. Agr. Yearbook 1932, pp. 524–528, fig. 1*).—These contributions include Freezing to Preserve Vegetables and Fruits Still in Pioneer Stage, by H. C. Diehl (pp. 524–527), and Fruit Preservation by Freezing Presents Many Problems for Research, by R. P. Straka (pp. 527, 528).

Light a factor in rancidity, M. R. Coe (*Science, 75 (1932), No. 1953, p. 585*).—In this note from the Bureau of Chemistry and Soils, U. S. D. A., it is stated that all samples of rice bran and rice polish, when kept under various color filters, showed characteristics of rancidity except the samples kept under sextant green and sextant red filters. These showed no evidence of deterioration either in odor or in tests with fuchsine sulfurous acid. The preservative action with the green filter is attributed to its absorption of all photochemically active wave lengths conducive to rancidity and of the sextant red filter to its absorption of practically all light. It is concluded that screening out certain wave lengths of light from oil-bearing foods may prevent or delay oxidation of the oil. "The keeping qualities of foods, such as salad oils, mayonnaise, butter, lard, and potato chips, may be greatly enhanced by the use of properly colored wrappers, bottles, etc., capable of screening out active light wave lengths."

It is stated that a U. S. public service patent and foreign patents have been applied for to cover this discovery.

Food-quality studies elicit facts that serve as guide to producers, F. B. King (*U. S. Dept. Agr. Yearbook 1932, pp. 560–562, fig. 1*).—A brief account is given of the general purpose and significance of studies carried on in the Bureau of Home Economics in cooperation with other agencies on the cooking qualities of varieties of rice (see page 123), of potatoes as affected by storage temperatures (E. S. R., 65, p. 891), and of meat as affected by various factors (E. S. R., 65, p. 393).

Memorandum to the Minister of Health on the criticism and improvement of diets, M. Greenwood et al. (*London: Min. Health, Advisory Com. Nutrition, 1932, pp. 14*).—This memorandum on the criteria of a satisfactory diet and economical means of improving unsatisfactory ones was prepared particularly for use by medical officers of health in Great Britain. The criteria of satisfactory diets are essentially the same as recommended in this country. A distinction is made between animal and vegetable proteins, and for a diet yielding 3,000 calories per man per day a minimum of 37 g of animal protein is specified. The recommendation for the distribution of calories in temperate climates is protein from 10 to 15 per cent, fat from 20 to 35 per cent, and carbohydrate from 50 to 75 per cent. Diets are considered to need improvement if the absolute quantities of protein and fat fall much below 80 and 50 g, respectively, per man per day. Included among the so-called protective foods, in addition to milk, fruits, vegetables, and eggs, are liver, fish (especially fat), and fish roe. No quantitative values are given for mineral requirements, but calcium, phosphorus, iodine, and iron are listed as essential.

Among the recommendations for improving the diet without increasing its cost are the use of cheese, herring, fish roe, and skim milk for the so-called first-class proteins, a minimum of 1 pint of milk a day as a protective food, vitamin-enriched margarines in place of butter, and a more abundant use of tomatoes, celery, hardy lettuce, endive, and water cress in season.

Low cost diets planned according to different standards, S. F. WEST (*Jour. Home Econ., 24 (1932), No. 2, pp. 113–118*).—Similar low cost diets for a family of two adults and three children were worked out according to the plans suggested by Rose (E. S. R., 59, p. 188) based upon the distribution of calories among six groups of food, by Stiebeling and Birdseye (E. S. R., 65, p. 192) based upon the weights of materials for the same six groups, and by the Sherman standard (E. S. R., 55, p. 691) based upon the proportion of the total cost to be allowed to each of eight groups of food materials.

The day's market order and menus are given for each of these plans, using approximately the same food materials in all three cases. The total calories as calculated by the three methods were, 12,400, 11,107, and 13,791 and the total cost $1.60, $1.46, and $1.72, respectively. In discussing the advantages and disadvantages of the three methods, the author states that the second method proved the simplest and most direct, but that the third method is probably the simplest for the housekeeper who keeps careful accounts. "All three methods insure an adequate diet, provided one allows, to start with, sufficient total calories for the family group in method 1, or, in method 3, takes as one's standard the milk requirement of the group and allows 1 qt. for each child and 1 pint for each adult."

Adequacy of daily menus at low cost in a home management house, I. H. GROSS and M. E. MOORE (*Jour. Home Econ., 24 (1932), No. 2, pp. 132, 133*).—A quantitative check on the adequacy of the diet at the home management house of Michigan State College for a period of 8 days in July, 1931, showed that at a cost of 26.7 cts. per person per day a diet had been selected which furnished 2,189 calories, 71.7 g of protein, 0.99 g of calcium, 1.49 g of phosphorus, and 0.16 g of iron. It is noted that the diet met the standard for everything with the possible exception of calories.

Quality studies of therapeutic diets.—I, The ulcer diet, L. TROUTT (*Jour. Amer. Dietet. Assoc., 8 (1932), No. 1, pp. 25–32*).—The study reported, which was conducted as a part of the program of work of the diet therapy section of the American Dietetic Association, consisted in the examination for adequacy according to accepted standards of the convalescent diets used by six leading hospitals in the treatment of gastric and duodenal ulcers, and the planning of food lists and menus to make up for some of the deficiencies found in the diets submitted. These deficiencies were chiefly iron, which was well below the Sherman standard in nearly every instance; vitamin C, which was not definitely provided for except in one instance; and vitamin B, which was considered to be on the border line. The menus recommended differed from the customary bland diet in the daily provision of orange juice, increased provision for green vegetables in amount and variety and for stewed strained fruit, and a decrease in the amount of purified starch products with the substitution of some whole grain cereals.

Protein intake and basal metabolism of college women, R. A. HETLER (*Jour. Nutrition, 5 (1932), No. 1, pp. 69–75*).—This study was conducted by the author, with the assistance of M. Killinger and M. Plant, on 85 women students at the University of Illinois. The subjects ranged in age from 19 to 37 years, but 85 per cent of them were between 19 and 24 years of age. Their weights

ranged from 42.7 to 82.8 kg, with an average of 56.8 kg. The quantitative data obtained included analyses for total nitrogen, creatinine, and acidity of at least two and usually three or more 24-hour urine specimens from each subject, and basal metabolism determinations on each subject repeated two or three times on successive days and always in the intermenstrual period. Approximate estimates of calories and protein in the diets were obtained from records of the food eaten for at least one period of from 3 days to 1 week.

The average urinary nitrogen per 24 hours amounted to 7.69 g, equivalent to 9.48 g per 70 kg body weight. On adding 10 per cent for protein loss in fecal nitrogen the protein equivalent for a 70-kg individual amounted to 65.8 g, or 0.94 g per kilogram of body weight. From the estimated food intake the average protein intake was calculated to be 0.97 g per kilogram of body weight. These figures represent a somewhat lower protein intake per kilogram than reported for men students by Denis and Borgstrom (E. S. R., 52, p. 761), Beard (E. S. R., 58, p. 492), and Brooks (E. S. R., 62, p. 582).

The average basal metabolism was 1,260 calories per 24 hours. In comparison with the Harris-Benedict prediction values, the individual values ranged from —20 to +11 per cent, with an average deviation of —7.1 per cent. Only 12 of the subjects had values above the predicted value. Although the determinations were made from October to June, no seasonal differences were noted.

A comparison of the basal metabolism figures with the protein intake showed no definite relationship between the two. On the lowest protein intake, 0.5 g daily, the values were the lowest, averaging —10.8 per cent for 6 subjects, but nearly as low values were shown by a group of 6 with a protein intake of 1.2 g. It is suggested, however, that the lower protein intake of women may be partly responsible for the fact that their basal metabolic rate is usually lower than that of men.

Nutritional edema.—I, The effects of the level and quality of protein intake on nitrogen balance, plasma proteins, and edema, S. H. Liu, H. I. Chu, S. H. Wang, and H. L. Chung (*Chinese Jour. Physiol., 6 (1932), No. 1, pp. 73–94, figs. 2*).—Two patients with nutritional edema at the Peiping Union Medical College Hospital were studied in the metabolism ward with reference to nitrogen balance, plasma proteins, and degree of edema under the influence of varying levels of protein intake of vegetable and animal origin.

The edema, which had originally been induced by a monotonous orphanage diet of corn bread, millet gruel, and cabbage, was reproduced or accentuated by nitrogen-free diets. The feeding of vegetable protein at a level of approximately 1 g per kilogram of body weight and 7 per cent of the total caloric intake proved insufficient to bring about a positive nitrogen balance, an increase of plasma protein, and disappearance of edema, but on the same intake of animal protein or double the quantity of vegetable protein recovery took place.

The digestibility and biological value of the nitrogen were much higher in the animal protein than the vegetable protein diets.

Nutritional anemia in infancy: Its treatment with liver extract and iron, J. Greengard (*Jour. Amer. Dietet. Assoc., 8 (1932), No. 1, pp. 33–41, figs. 4*).—A comparative study is reported of the value of iron and liver extract, alone and combined, in the treatment of anemias of infancy.

In a group of 10 infants ranging in age from 6 to 22 weeks at the beginning of the experiment, treatment with saccharated ferrous carbonate in 1-g doses three times a day resulted in gains of from 10 to 35 per cent in hemoglobin in 5, losses during respiratory infections in 2, and gains in 2 only after liver extract was administered in addition to the iron. In the group receiving liver extract there were 13 infants from 7 to 24 weeks old at the beginning of the experiment.

Seven showed gains in hemoglobin ranging from 10 to 15 per cent, and in 3 who failed to improve on the liver extract alone, good gains in hemoglobin were made following the addition of iron. All of a group of 18 infants from 6 weeks to 10 months of age who received 1 teaspoonful of liver extract containing 1 g of saccharated iron carbonate three times a day made good gains in hemoglobin and red cells. A definite improvement in general nutrition occurred in all cases following the initiation of liver therapy.

Studies on iron metabolism and the influence of copper, H. W. Josephs (*Jour. Biol. Chem., 96 (1932), No. 2, pp. 559–571, figs. 6*).—In this investigation the retention of iron and its partition between the hemoglobin and the tissues have been studied in rats as follows:

In the first series of experiments, one group of 35 rats was given milk alone after weaning, another group of 18 milk with the addition of 0.5 mg of iron, and a third group of 9 milk with the same addition of iron and 0.1 mg of copper per day. One animal from each group was sacrificed every few days for determination of total iron. From the percentage of hemoglobin and the weight of the animal just before it was killed, the total hemoglobin content of the body and from that the hemoglobin iron content were calculated.

The data obtained showed that the addition of iron alone or with copper resulted in a 10 per cent retention of iron. Copper, while not influencing the total retention, increased the proportion of retained iron found in hemoglobin. The iron content of the tissues was lower in the animals receiving iron and copper than in those receiving iron alone and practically the same as those receiving unsupplemented milk, showing that practically all of the iron retained under these circumstances was used for hemoglobin formation. In similar calculations for suckling rats, the curve of iron retention was nearly parallel with that of gain in hemoglobin iron during the nursing period. At about 30 days the concentration of tissue iron reached a level below which it did not go. This was maintained first at the expense of hemoglobin, but after this reached a minimum level the tissue iron was maintained at the expense of growth.

The second series of experiments consisted of paired feeding experiments, one animal receiving iron alone and the other iron and copper as supplement to the milk. After a considerable period, the rats were killed and estimates made as in the first series of the distribution of iron. These tests likewise showed greater utilization of the retained iron for hemoglobin formation and smaller deposition of iron in the tissues under the influence of copper.

In the final series, direct analyses for iron were made of the blood-free tissues of rats on milk alone, milk with copper, milk with iron, and milk with iron and copper. The results confirm in every way those of the other two series.

Based upon these findings, the metabolism of iron in the body is pictured graphically and discussed. The nonhemoglobin or tissue iron is considered to be divided into two parts, a variable or mobile portion and a fixed portion. Copper is thought to influence the mobile portion (1) by preventing the cells that ordinarily store iron from taking it up or causing them to give it up, (2) by generally stimulating the hematopoietic tissue or specifically increasing the rate of hemoglobin formation by a catalytic action, or (3) by decreasing the rate of hemoglobin breakdown.

A study of certain metals in the prevention of nutritional anemia in the rat, J. M. Orten, F. A. Underhill, and R. C. Lewis (*Jour. Biol. Chem., 96 (1932), No. 1, pp. 1–9, figs. 3*).—This study is similar to the one noted previously (E. S. R., 65, p. 894) except that preventive instead of curative methods were followed. The supplements to the milk consisted of 0.5 mg of iron; 0.5 mg of

iron and 0.025 mg of copper; 0.5 mg of iron and 1 or 0.1 mg of manganese; 0.5 mg of iron with a mixture of 1 mg of manganese, 0.5 mg of cobalt, 1 mg of nickel, and 0.5 mg of zinc; and 0.5 mg of iron, the same mixture of other metals, and 0.025 mg of copper. All of the experiments continued for 4 months unless death took place earlier. From 6 to 8 rats were used in each group.

Iron alone failed to prevent development of anemia. On iron supplemented with copper normal hemoglobin levels were maintained. On iron supplemented with manganese anemia was not prevented, but there was some beneficial effect on growth and length of life. The mixture of manganese, cobalt, nickel, and zinc as a supplement to iron did not prevent the development of anemia, but when copper was added to the mixture normal or somewhat higher levels of hemoglobin resulted for from 3 to 5 weeks and then a definite increase above normal.

The experiments are thought to confirm the conclusion that copper is a necessary supplement to iron in preventing nutritional anemia of the rat.

Polycythemia in the rat on a milk-iron-copper diet supplemented by cobalt, J. M. Orten, F. A. Underhill, E. R. Mugrage, and R. C. Lewis (*Jour. Biol. Chem., 96 (1932), No. 1, pp. 11–16*).—The explanation of the rise of hemoglobin noted above as resulting from the combination of copper with a mixture of various other metals as a supplement to iron has been noted from a preliminary report (E. S. R., 67, p. 488). The element responsible for polycythemia, as thus observed, is cobalt in conjunction with copper. When fed at a 0.5 mg level as cobalt chloride or sulfate, with copper as supplement to the milk-iron diet, marked polycythemia resulted which persisted as long as the cobalt feeding was continued. The hemoglobin, erythrocyte, and cell volume values showed a parallel rise, while the leucocyte and differential leucocyte counts showed no significant changes.

Factors which determine the concentration of calcium and of inorganic phosphorus in the blood serum of rats.—Second paper, B. Kramer and J. Howland (*Jour. Nutrition, 5 (1932), No. 1, pp. 39–60*).—In this study, supplementing an earlier one noted previously (E. S. R., 48, p. 564), the authors, with the technical assistance of I. F. Gittleman, analyzed for calcium and phosphorus the sera of a large number of rats receiving varying proportions of calcium, phosphorus, butterfat, and cod-liver oil. The rats were from McCollum's laboratory, and the work was done in 1924 and 1925. The results obtained are interpreted in the light of present knowledge, with references to various publications which have appeared in the interim.

On diets containing minimal amounts of vitamin D, the calcium of the serum varied directly with the calcium concentration of the diet. This was also true of the phosphorus. Increasing the calcium in the diet increased the calcium and decreased the phosphorus in the serum. Increasing the phosphorus led to a decrease in the calcium content of the serum unless the amount in the diet was increased. As the concentration of vitamin D in the diet increased, the effects of unfavorable proportions of calcium and phosphorus were less marked. When the ratio of Ca:P was 1.5, normal values of both elements resulted irrespective of the amount of vitamin D within the limits of the experiment, but with increasing vitamin D there was increased growth.

The data are thought to show that either the calcium or phosphorus concentration of the diet (the Ca:P ratio) or vitamin D may be the limiting factor in growth. Concerning the maintenance of normal concentrations of serum calcium and inorganic phosphorus, the authors are of the opinion that it is the "resultant of the rate of absorption of these elements from the gastrointestinal tract, their rate of deposition in the tissues, particularly the bones,

and the rate of excretion by the bowel and the kidneys and of certain physicochemical conditions in the blood."

Calcium and phosphorus studies, I–III, D. H. Shelling (*Jour. Biol. Chem., 96 (1932), No. 1, pp. 195–214, figs. 6, pp. 215–228, figs. 2, pp. 229–243*).—Three papers are presented covering an investigation noted previously from progress reports. The author had the assistance of D. E. Asher.

I. *The effect of calcium and phosphorus of the diet on tetany, serum calcium, and food intake of parathyroidectomized rats.*—In addition to the data summarized in the progress report (E. S. R., 64, p. 593), attention is called to the marked degree of anorexia present in parathyroidectomized rats fed tetany-inducing diets and the prompt disappearance of the symptoms when the dietary phosphorus was reduced. The well-known ability of milk to relieve tetany and meat to induce it is thought to depend largely upon the different proportions of calcium and phosphorus in these two foods.

II. *The effect of diet and of viosterol on the tetany and on the serum calcium of parathyroidectomized rats.*—Essentially noted from the preliminary report (E. S. R., 64, p. 593).

III. *The source of excess serum calcium in viosterol hypercalcemia.*—The experiments noted in the preliminary report (E. S. R., 64, p. 592) have been extended to diets free from calcium and from both calcium and phosphorus. Hypercalcemia was induced in both cases, as noted by the serum calcium level and incidence of metastatic calcification and other symptoms on both types of diets, but to a greater degree on the diets free from both calcium and phosphorus. On these diets there was an increased excretion of both calcium and phosphorus in the urine, but when an excess of phosphorus was added to the diet the excretion of calcium shifted to the feces. On both diets calcification in the soft tissues did not always take place, but there was rapid dehydration, wasting, and tissue necrosis. The bones in many instances showed marked osteoporosis.

The findings are discussed at considerable length with reference to the conflicting reports in the literature concerning the mechanism of the excess excretion of calcium and phosphorus in viosterol calcemia.

Phosphatase in growth and disease of bone, H. D. Kay (*Physiol. Rev., 12 (1932), No. 3, pp. 384–422, figs. 3*).—This review of the literature is presented under the headings of the discovery of the enzyme, properties of mammalian phosphatase, and the biological significance of bone phosphatase. In the conclusion the author enumerates the various factors which have to be considered in the study of calcification and bone formation from the biochemical standpoint, and points out that in the consideration of nearly every one of these the necessity for some local condition in the calcifying tissue favoring local deposition of calcium and phosphate has been emphasized. It is considered that the acceptance of the presence of phosphatase in calcifying cartilage "provides a local factor for which there has been an obvious need ever since the first attempt was made to understand the biochemistry of bone formation."

Studies on magnesium deficiency in animals.—I, Symptomatology resulting from magnesium deprivation, H. D. Kruse, E. R. Orent, and E. V. McCollum (*Jour. Biol. Chem., 96 (1932), No. 2, pp. 519–539, figs. 4*).—The authors have succeeded in preparing a diet containing only 1.8 parts per million of magnesium but otherwise adequate. When young rats are placed on this diet, all of the exposed skin areas become vividly red in from 3 to 5 days from vasodilatation. This becomes intensified until about the eleventh to the fourteenth day, when it subsides and is followed by slight cyanosis. The animals become increasingly irritable until about the eighteenth day when convulsions occur. Most of the animals die following the first attack, but a few survive two or more attacks.

The syndrome produced by magnesium deficiency is thought to constitute tetany differing from other known types only in the vasodilatation. It is concluded that magnesium is an essential element for certain bodily activities, growth, and life.

The parathyroid glands, D. L. Thomson and J. B. Collip (*Physiol. Rev., 12 (1932), No. 3, pp. 309–383*).—Sections of particular interest in this extensive literature review are the relation of the parathyroid hormone to the calcium of the skeleton (pp. 339–345), vitamin D in relation to the parathyroid glands (pp. 345–349), and the relation of other endocrine glands to calcium metabolism (pp. 349–353). A bibliography of 543 titles is appended.

Vitamin content of many foods measured by tests with rats, H. E. Munsell (*U. S. Dept. Agr. Yearbook 1932, pp. 566, 567, figs. 2*).—A brief discussion is given of the importance of vitamins in nutrition and methods of measuring vitamin values, with a table of unit values of vitamins A and C in some common foods.

The effects of carotene and of vitamin A on the oxidation of linoleic acid, B. R. Monaghan and F. O. Schmitt (*Jour. Biol. Chem., 96 (1932), No. 2, pp. 387–395, figs. 3*).—The experiments reported differ from those of Olcott and Mattill (E. S. R., 66, p. 608) in that they were concerned only with the period of rapid oxygen consumption following the induction period instead of with the induction period alone. The authors are of the opinion that "in measuring the pro- or antioxidant activities of a substance which itself is subject to oxidation, it is essential to distinguish between the effects of the original substance and those of the oxidized form. Measurements on the length of the induction period, especially when this period lasts for many hours, may yield little information on the action of the original substance which may have been partially or completely oxidized in the course of the experiment."

The materials tested included carotene of melting point 172 to 173° C.; pure linoleic acid, iodine number 180; oxidized carotene, obtained by dissolving carotene crystals in caproic acid and exposing them to air until the color of the solution changed to a light yellow; and a freshly prepared vitamin A concentrate consisting of the unsaponifiable material of cod-liver oil extracted with ether and the ether subsequently evaporated.

Carotene greatly inhibited the oxygen uptake of the linoleic acid, and oxidized carotene slightly accelerated it. Vitamin A in very low concentration completely inhibited the oxygen intake for some hours, the effect wearing off with the oxidation of the vitamin.

These observations are thought to suggest the possibility that vitamin A may be concerned with phospholipid metabolism. "The pathology of vitamin A deficiency also supports the above suggested relationship. The cessation of growth typical of vitamin A deficiency is accompanied by specific lesions of glandular tissues which contain relatively large amounts of phospholipids of a high degree of unsaturation. Cytological evidence points to the conversion of the cells of secreting epithelia to a keratinized, inactive type of cell. Such changes must involve deep-seated modification of cellular elements such as the Golgi apparatus and mitochondria which are phospholipid in nature. Experiments designed to test this suggested importance of vitamin A as a regulator of phospholipid metabolism in the animal organism are well under way." It is stated that preliminary results indicate a large difference in the phospholipid content of normal and vitamin A-deficient rats.

Comparison of soybeans and milk in contents of vitamins B_1 and B_2, S. Wan (*Chinese Jour. Physiol., 6 (1932), No. 1, pp. 35–40, figs. 9*).—Parallel feeding experiments conducted on rats with yellow soybeans, dried and finely ground, and whole milk powder (Klim) as sources of vitamin B (with auto-

claved yeast prepared as described by Quinn et al. (E. S. R., 65, p. 295) as the source of vitamin G) and of vitamin G (with tikitiki as the source of vitamin B) are reported, with the conclusion that the soybeans contained only two-thirds as much vitamin G, but more than three times as much vitamin B, as the milk powder. In terms of actual quantities fed, from 0.6 to 0.9 g of the dried soybeans was said to promote normal growth when fed as the source of either B or G. On the same quantity of dried milk as the source of B, growth was far below normal, while on 0.3 g of the milk as the source of vitamin G growth was practically normal.

The quantitative estimation of vitamin D by radiography, R. B. Bourdillon, H. M. Bruce, C. Fischmann, and T. A. Webster ([*Gt. Brit.*] *Med. Research Council, Spec. Rpt. Ser. No. 158 (1931), pp. 48, pls. 2, figs. 4*).—This report gives a detailed account of a method developed for use at the National Institute for Medical Research, Great Britain, for the quantitative estimation of vitamin D. The method is based on the radiographic examination of the healing of rickets in rats for which an arbitrary logarithmic scale has been developed, showing 12 different degrees of healing. A study of the errors to be expected in routine estimates of vitamin D by this method has shown that the probable error in a test based on 20 pairs of rats is about 8 per cent and the maximum error to be expected in 1 out of 22 such tests is +26, or −19 per cent. A method is described for similar estimation of the probable error of tests using any number of rats. The sources of error are discussed at considerable length, with the conclusion that "the chief sources of error are (1) variation in response of litter mates to vitamin; (2) the error of diagnosis of the degree of healing, which causes nearly one-third of the total error.

"Very large variations were observed in the mean response of the stock to a constant dose of vitamin at different periods. These variations are attributed to unknown changes in the composition of maize or other articles of diet which were purchased at monthly intervals. It is pointed out that their occurrence emphasizes the importance of using a standard solution in routine testing."

The standardization of vitamin D preparations [trans. title], J. W. R. Everse and J. van Niekerk (*Nederland. Tijdschr. Geneesk., 75 (1931), I, No. 10, pp. 1101–1107, pl. 1, figs. 2*).—The authors employ a curative technic with X-ray examination of the bones and matching against photographs showing eight stages from severe rickets to complete recovery. In a number of preparations obtained by irradiating ergosterol with light of different wave lengths a parallelism was noted between the antirachitic activity, as determined by the authors' method, and the substance thought by Reerink and Van Wijk to be vitamin D as determined by absorption spectra (E. S. R., 67, p. 103).

Antirachitic value of milk from cows fed irradiated yeast, E. T. Wyman and A. M. Butler (*Amer. Jour. Diseases Children, 43 (1932), No. 6, pp. 1509–1518, figs. 4*).—Milk from cows fed 60,000 rat units per day of irradiated yeast according to the method described by Thomas and MacLeod (E. S. R., 66, p. 463) was tested for antirachitic properties on two infants and two children suffering from advanced active rickets. All of the milk was pasteurized, and in addition the milk for one of the children was boiled for 5 minutes. The subjects were confined in bed during the entire time, and the progress of the rickets was followed by frequent Röntgenograms and serum, calcium, and phosphorus determinations. Calcium and phosphorus balances, to be reported later, were conducted on one of the infants. Detailed case reports are given for all of the subjects.

In approximately 2 weeks after the administration of milk had been started, deposition of bone could be seen in the Röntgenograms of all of the subjects.

In those receiving the pasteurized unboiled milk the Ca: P product of the blood serum had risen to 47 mg or over and in the other subject to only 38.2 mg. At the end of 28 days, however, the product had risen in this subject to 49.3 mg. Although healing was not as rapid as in the other child, in whom complete healing occurred in 6 weeks, complete recovery finally resulted.

The authors agree with Hess and associates (E. S. R., 66, p. 493) that the administration of vitamin D in this form has certain advantages, particularly in requiring a minimum of cooperation on the part of the mother.

Additional factors in the treatment of late rickets and osteomalacia, D. C. Wilson (*Lancet* [*London*], *1932, I, No. 22, pp. 1142, 1143*).—A dried yeast powder prepared in India from the different varieties of yeast remaining in distillery vats after fermentation and irradiated for 8 hours in direct sunlight has been found of value as a source of vitamin D in the treatment of late rickets and osteomalacia (E. S. R., 65, p. 398). It is suggested that such yeast may also be of value in the treatment of nutritional disorders due to deficiency of vitamin B.

Vitamin G and the growth factor in tomato juice, R. G. Daggs and A. G. Eaton (*Science, 75 (1932), No. 1938, pp. 222, 223*).—Data are summarized briefly on biological tests for vitamin G in fresh and canned tomato juice. In addition to 5 negative controls, 10 groups of 7 rats each were used. After 1 week of depletion on the basal diet devoid of all factors of the vitamin B complex, graded doses of tomato juice, from 3 to 7 c c, were fed daily for 8 weeks, one group receiving fresh and another canned juice at the same level.

The negative controls and the animals receiving 3 c c of juice daily died of polyneuritis before dermatitis developed. In the other groups dermatitis developed in approximately 44 days regardless of the quantity of tomato juice fed. On the small doses the animals lost weight and on the larger doses gained weight. The gains were not proportional to the dosage and in all cases were higher on the canned than on the fresh juice at the same level.

These results are thought to show the absence of vitamin G (antipellagric) in tomato juice, a result in disagreement with the findings of Goldberger et al. (E. S. R., 57, p. 295; 60, p. 793) and of Hartley, as quoted by Sherman and Smith (E. S. R., 65, p. 587). It is suggested that the growth factor is probably the one named vitamin B_4 by Reader (E. S. R., 65, p. 594) and referred to as vitamin F by Sure et al. (E. S. R., 65, p. 494).

A comparison of the vitamin G values of pasteurized milk, evaporated milk, and eggs, E. N. Todhunter (*Jour. Amer. Dietet. Assoc., 8 (1932), No. 1, pp. 42–46*).—The materials which were used for quantitative vitamin G determinations by the method of Bourquin and Sherman (E. S. R., 66, p. 410) included a composite sample of five brands of evaporated milk available in the market and produced for the experiment in Wisconsin (four brands) and in Pennsylvania (one brand) and packed in January, June, and September; a composite sample of two brands of pasteurized milk available in the New York City market; and eggs bought from week to week in the open market during summer and winter. The evaporated milk was diluted according to the instructions on the containers with an equal part of distilled water, and the eggs were cooked in boiling water for 9 minutes, removed from the shells, and rubbed through a sieve until the whites and yolks were thoroughly mixed. The diluted evaporated and pasteurized milk samples were fed in quantities of 12 and 24 c c per week and the eggs in quantities of 2.25, 4.5, and 9 g per week.

From the growth data obtained the diluted evaporated milk was calculated to contain 300 units per pound, or 0.66 unit per gram of vitamin G, the pasteurized milk 335 units per pound, or 0.74 unit per gram, and the eggs

600 units per pound, or 1.3 units per gram. The author concludes that "milk and eggs are, therefore, good sources of vitamin G."

Experimental production of kidney lesions by diet, W. CRAMER (*Lancet [London], 1932, II, No. 4, pp. 174, 175, pl. 1*).—In rats kept on synthetic diets varying only in the proportion of inorganic salts, it was found that the omission of magnesium salts produced extensive degenerative changes in the glomeruli and tubules of the kidneys. Since no attempt was made to remove every trace of magnesium from the diet, the experimental conditions differ from those of Kruse, Orent, and McCollum, noted on page 130, involving rigid exclusion of magnesium. In the present experiment the animals remained normal in outward appearance, growth, and general nutritive condition, the only organ affected being the kidneys, while in the animals observed by Kruse et al. there were general pathological lesions. Attention is called to the use of magnesium sulfate in the treatment of hemorrhagic nephritis in children. The observations reported are considered to offer an explanation, and to warrant a more extensive use of magnesium sulfate in the treatment of certain types of nephritis.

The effect of oral administration of amino acids and intraperitoneal injection of various elements and hydrochloric acid on regeneration of hemoglobin, H. L. KEIL and V. E. NELSON (*Jour. Biol. Chem., 97 (1932), No. 1, pp. 115–126, figs. 3*).—In addition to the complete report of studies noted from a preliminary report (E. S. R., 67, p. 348), data are given showing that tyrosine, tryptophane, glutamic and aspartic acids, and arginine, when fed at a level of 100 mg daily, are incapable of promoting hemoglobin regeneration in rats suffering from nutritional anemia.

Design and use of a glass cage in anemia studies, J. T. SKINNER, H. STEENBOCK, and W. H. PETERSON (*Jour. Biol. Chem., 97 (1932), No. 1, pp. 227–234, figs. 4*).—A glass cage designed originally for use in nutritional anemia studies with rats is described and illustrated. In actual use the cage proved less suitable for anemia studies than the usual cage constructed of galvanized iron wire. This difference is attributed to increased coprophagy resulting from the greater adhesion of the feces to the glass rods forming the bottom of the cage than to the wire in the bottom of ordinary cages.

The control of pellagra, G. A. WHEELER and W. H. SEBRELL (*Jour. Amer. Med. Assoc., 99 (1932), No. 2, pp. 95–98*).—In the opinion of the authors the factors involved in the origin of endemic pellagra, which accounts for more than 98 per cent of all pellagra in this country, are "limitation of the kind and quantity of food crops produced, resulting in an undue restriction in variety, lack of availability of certain essential foods and foodstuffs during certain seasons, adverse economic conditions with reduced purchasing power, and a general lack of thrift with its resultant impoverishment and malnutrition. . . . In other words, endemic pellagra is largely a by-product of the more modern one-crop system of agriculture as practiced in the South. Its elimination will follow the adoption of a more diversified diet available at all seasons. This, in turn, must rest on either home production of a wider assortment of foods or a constant purchasing power covering a wider range. Nothing short of this can bring about a satisfactory solution of the problem."

Practical suggestions are given for public health measures to help solve the problem.

TEXTILES AND CLOTHING

Technological reports on standard Indian cottons, 1932, N. AHMAD (*Indian Cent. Cotton Com. [Bombay], Technol. Bul., Ser. A, No. 21 (1932), pp. IV+109, figs. 19*).—The current edition resembles the previous report (E. S. R.,

66, p. 529) in scope, and includes the results of textile tests on the standard Indian cottons of the 1931–32 season and summarized data on the seasons 1923–1932, inclusive.

The relation of price to the physical characteristics of some white cotton fabrics, M. Griffith and H. Strow (*Ohio Sta. Bimo. Bul. 158 (1932), pp. 186–188*).—The fabrics studied included three broadcloths ranging in price from 80 cts. to $1.36, one poplin at 59 cts., one Tarantulle at $1.01, and two cambrics at 29 and 49 cts. a square yard, respectively. The first four fabrics were of cord weave and the others of plain weave construction. The fabrics were analyzed for thickness, weight per square yard, percentage shrinkage, yarn count in yards per pound, and diameter of yarn for both warp and filling. Tests were also made of the thread count and of the breaking strength of warp and filling.

The cord weave fabrics were thicker and more highly mercerized than the plain weave. For both types of weave there was greater shrinkage in the warp yarn than in the filling yarn. The lower priced fabrics of both weaves showed stretching in the filling direction. One of the broadcloth samples and the Tarantulle, the first a cord weave and the second a plain weave shirting, cost the same per square yard. The broadcloth sample showed no shrinkage in the filling direction as compared with 1.16 per cent shrinkage in the plain weave Tarantulle, less shrinkage in the warp direction, greater weight per square yard, greater thickness, and a more evenly balanced yarn count. It was also stronger in the breaking and bursting tests.

With one exception, all of the fabrics were stronger when wet than dry. There was no relationship between thread count and breaking strength. The best balance in thread count was found in the 80-ct. broadcloth and the 29- and 49-ct. cambrics. Of the three broadcloths, the one costing the least showed the greatest strength in the breaking and bursting tests, the least deviation in strength, and a better balanced thread count. As judged by the bursting and breaking strength tests, the 49-ct. cambric showed no superiority over the 29-ct. cambric.

These findings show that price is not always an indication of quality in a fabric.

Cotton is utilized as new foundation material for making hooked rugs, B. M. Viemont (*U. S. Dept. Agr. Yearbook 1932, pp. 558–560, fig. 1*).—This contribution from the Bureau of Home Economics describes an inexpensive cotton fabric which has been developed particularly for use as the foundation of hooked rugs. The construction, thread count, weight per square yard, and thickness of the new fabric are practically the same as art burlap, but the tensile strength of the warp and filling is more even than that of burlap. The tensile strengths per inch of the warp and filling of the new material are 137 and 133 lbs. and of the art burlap 85.6 and 176.2 lbs., respectively. Various other advantages of the new material are listed.

The bactericidal effectiveness of home laundering methods for silk and rayon, E. H. Roberts (*Washington Col. Sta. Bul. 265 (1932), pp. 24*).—This is the complete report of an investigation noted previously from a preliminary report (E. S. R., 66, p. 798). In all, four series of experiments were conducted to determine (1) the normal count of bacteria on garments (viscose undershirts) exposed to the air in a laboratory room for from 10 to 12 hours and the number and percentage of bacteria removed from similar garments after inoculation, as noted in the preliminary report, and the number of bacteria removed by (2) the mechanical agitation of washing, (3) indoor and outdoor drying after ordinary washing, and (4) ironing alone.

The average bacterial count of the garments exposed to air was approximately 200 per square inch. Washing in suds and rinsing twice eliminated from 20 to

50 per cent of the original number of organisms placed on the garment. Washing and drying removed approximately 99 per cent of the bacteria. The bacterial count was lower on clothes dried outdoors than on those dried indoors. Ironing alone removed practically all of the bacteria. "Temperatures of 300° to 400° F. are sufficiently germicidal for the nonspore-bearing bacteria and for some of the spore-bearing types if the time factor is great enough."

A brief discussion of the hygiene of laundering is included and a list of 20 references to the literature is appended.

Laundry tests under scientific control show how to prevent damage, K. M. Downey (*U. S. Dept. Agr. Yearbook 1932, pp. 569–572, figs. 4*).—In connection with an investigation by the Bureau of Home Economics of the wearing quality of different sheetings manufactured from known grades of raw cotton under supervision of the Bureau of Agricultural Economics, a method has been developed for the detection of damage by heat in laundering when the heat has not been enough to cause a stain on the fabric. The method consists essentially in removing the sizing from the fabric by the use of enzymes and a light washing process, conditioning the sample in a controlled humidity room in which a relative humidity of 65 per cent is maintained, and then passing the fabric through an experimental ironer provided with pressure and temperature control. Portions of the fabric are then subjected to viscosity tests and color measurements of surface changes by means of which the degree of tendering and extent of damage to the surface are determined.

It is noted that when the ironer is set for a pressure of from 1 to 1½ lbs. per square inch changes in certain 4-oz. sheetings have been detected for temperatures as low as 473° F., a condition considered comparable with hand ironing. It is noted, moreover, that under service conditions for a period of time the washing procedure appears to influence the scorching temperature of a fabric.

Standards for children's clothes stress comfort, simplicity, and self-help, L. Stanley (*U. S. Dept. Agr. Yearbook 1932, p. 568*).—A brief account is given of the attempts which have been made at the Bureau of Home Economics to develop standards for children's clothing from the point of view of comfort, ease of care, and simplicity of design (E. S. R., 66, pp. 97, 199).

HOME MANAGEMENT AND EQUIPMENT

Living standards on the farm (*U. S. Dept. Agr. Yearbook 1932, pp. 549–556, 562–564, fig. 1*).—Included in these pages are articles contributed by the Bureau of Home Economics as follows:

Family living standards depend on use as well as on size of income, F. M. Williams (pp. 549–551).—A comparison is reported of the cash incomes and expenditures for various items of family living of 227 families in Knott County, Ky., in the Appalachian Highlands, of 2,886 farm families in 11 States, and of 40 families in Maryland, Vermont, Illinois, and Ohio. The data for the first two groups were obtained by the survey method and for the third group by the account book method.

The average yearly money expenditures for the three groups were $450, $913, and $1,684, respectively. In the first group more than one-third of the cash expenditures was for food, another third for clothing, and the rest for all other items. In the second group only 24 per cent of the total expenditures was for food, 26 per cent for clothing, leaving 50 per cent of the total for all other items. In the third group, with the highest total expenditures, only 19 per cent was spent for food and 14 per cent for clothing, leaving slightly more than two-thirds of the total for other items. The money values of the food raised on the farm for family use were $430, $440, and $540; the average

values of the houses $340, $2,000, and nearly $5,000; the money values of all goods and services furnished to the families by the farms $546, $684, and $876; and the total values of the family living $996, $1,598, and $2,560, respectively.

It is pointed out in conclusion that "the improvement of farm-family living is largely dependent, of course, upon increase in cash income, but it is also true that important changes can be made by planning family expenditures more carefully and by utilizing the resources of the farm with increasing skill for bettering the conditions of family life."

Home economics research assists home makers to spend income wisely, L. Stanley (pp. 552, 553).—This is a brief discussion of the practical services of the bureau in maintaining and improving standards of living and of the research in progress on consumer needs as a guide to production markets.

Dividing the food dollar into five parts helps to safeguard low-cost diet, H. K. Stiebeling (pp. 553–556).—Suggested weekly food supplies are listed for a family of five (two adults and three children) with low income and with comfortable means, respectively. It is stated that the former supplies at the retail prices at the time of writing would cost from $7.50 to $10 a week and the latter from $15 to $18 a week in the city, but that the better diet is quite within the reach of farm families of low cash income if the farmer "raises the right kinds of food in the right amounts, and if the housewife preserves the surplus for winter use. On most farms the acres devoted to home food production and the hours devoted to food conservation bring very gratifying returns."

Leisure of home makers studied for light on standards of living, H. Kneeland (pp. 562–564.—Data are presented and discussed briefly, with special reference to leisure, on the average daily distribution of time among various activities by 1,041 home makers in different parts of the country, including 642 farm home makers, 287 other rural home makers, and 112 urban home makers in towns of from 2,500 to 50,000.

The records showed a surprising uniformity in the time spent in the work of home making by the three groups, averaging 7 hours 23 minutes per day for the farm home maker, 7 hours 20 minutes for other rural home makers, and 7 hours 18 minutes for urban home makers. The greater time spent on farm and other work by the first group raised the total average work time to 8 hours 47 minutes as compared with 8 hours 1 minute and 7 hours 31 minutes for the other two groups, respectively. The differences were slight among the three groups for time spent in personal needs, averaging 10 hours 56 minutes, 11 hours 10 minutes, and 11 hours 11 minutes, respectively.

Leisure time activities were classified as informal social life; reading; meetings, study, church, and community work; other leisure activities; and transportation to and from home. The average time for all of these amounted to 3 hours 56 minutes, 4 hours 30 minutes, and 5 hours 3 minutes, respectively. The greatest variation in the three groups was in reading and miscellaneous leisure activities, which occupied much less time for the farm home maker than the other two groups. That the women from whom these records were obtained kept careful track of their time is shown by the fact that for the three groups the activities during 21, 19, and 15 minutes only were not clearly reported.

In answer to the question as to whether these home makers had a reasonable amount of leisure, attention is called to the fact that even the town housewives had on an average a heavier working week than most industrial workers at the present time and the majority of the farm women were appreciably overworked. It is noted that "these working hours, moreover, must be maintained with little leeway throughout the 52 weeks of the year. Unlike most occupa-

tions, home making does not usually include vacations or slack seasons, or even holidays. And the leisure which it does allow seldom leaves the home maker free from her job for more than a few hours at a time."

Studies in the design of kitchens and kitchen equipment, D. G. CARTER (*Arkansas Sta. Bul. 276 (1932), pp. 31, figs. 15*).—Essentially noted from another source (E. S. R., 67, p. 350).

MISCELLANEOUS

Yearbook of Agriculture, 1932, A. M. HYDE ET AL. (*U. S. Dept. Agr. Yearbook 1932, pp. IV+975, figs. 221*).—This contains the report of the Secretary of Agriculture, about 150 brief articles arranged alphabetically by subjects and discussing recent developments under the general title of What's New in Agriculture, series of papers under the headings of Farm Mechanization, Our Land Use Problem, Farm Data in 1930 Census, How to Use Farm Credit, New Uses for Farm Products, Fertilizer Developments, and Living Standards on the Farm, noted elsewhere in this issue, and agricultural statistics noted on page 120.

Forty-third Annual Report of the Kentucky Agricultural Experiment Station for the year 1930, Part II (*Kentucky Sta. Rpt. 1930, pt. 2, pp. [2]+723+[3], pls. 20, figs. 51*).—This contains reprints of Bulletins 299–313, all of which have been previously noted.

Thirty-ninth Annual Report [of Minnesota Station], 1931, A. BOSS (*Minnesota Sta. Rpt. 1931, p. 87*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Report of the Raymond Branch Experiment Station, [1931], H. F. WALLACE (*Mississippi Sta. Bul. 299 (1931), pp. 16, fig. 1*).—The experimental work reported is for the most part abstracted elsewhere in this issue.

Facts about the Geneva Station (*New York State Sta. Circ. 136 (1932), pp. 33, figs. 54*).—A booklet briefly describing the work of the station and prepared in connection with its fiftieth anniversary (E. S. R., 66, p. 701).

NOTES

Connecticut State Station.—Dedication exercises for the Jenkins laboratory (E. S. R., 66, p. 395) were held October 11, 1932. The program included addresses by Governor Wilbur L. Cross on The State and the Experiment Station, Director J. G. Lipman of New Jersey on The Agricultural Station as a Public Service Institution, and Dr. E. M. East, formerly of the station, on Edward H. Jenkins—the Man and the Public Servant. Following the exercises a bronze memorial tablet given by the station staff was presented by Dr. E. M. Bailey. This tablet bears the inscription—Scholar–Scientist–Administrator–Beloved of Men.

Massachusetts College.—Dr. Hugh P. Baker, dean of the New York State College of Forestry at Syracuse University, has been appointed president and will enter upon his new duties about February 1, 1933.

Rhode Island College.—Dr. John H. Washburn, president and professor of agricultural chemistry from 1889 to 1902, and subsequently director of the National Farm School at Doylestown, Pa., until his retirement in 1917, died August 3, 1932, aged 73 years. Dr. Washburn was a native of Massachusetts and a graduate of the Massachusetts College in 1878. He carried on graduate work in chemistry there and in Brown University and in 1889 received from the University of Göttingen the Ph. D. degree, taking for his thesis the sugar content of American sweet corn. He taught chemistry in the public schools for several years and in the Storrs Agricultural School from 1883 to 1887.

As a pioneer president of two schools of very diverse background and objectives, Dr. Washburn rendered valuable service in establishing a solid foundation and high ideals, his own sound fundamental training and appreciation of the value of such training in others being especially helpful. He was also a very useful early worker in the Association of Agricultural Colleges and Experiment Stations, serving as secretary-treasurer from 1894–1897, as a member of the executive committee from 1897 to 1900, and as vice president in 1901.

Association of Official Agricultural Chemists.—The forty-eighth annual meeting of this association was held in Washington, D. C., from October 31 to November 2, 1932, with an attendance approximating that under normal conditions.

The address of the president, A. E. Paul of the U. S. D. A. Food and Drug Administration, was entitled Conservative Progressiveness and dealt with the history and policies of the association. Conservatism was set forth as necessarily the most fundamental doctrine in its creed, but it was made clear that marked progressiveness had also characterized many of its developments, and that its field of operations had been materially broadened in response to changing conditions. In conclusion Mr. Paul pointed out that the association has been "decidedly progressive in the matter of entering new fields, in taking up new subjects, and in studying new methods, but it is unique in its conservatism in finally adopting methods. The requirements are so rigid that any danger of erroneous methods being included is practically excluded. No other agency in this or any other country, so far as we are aware, parallels it, and as a result it merits the unique distinction of authority which is accredited to it by the chemical world."

The remainder of the program followed the general lines of recent years. The second Wiley memorial address was given by Dr. F. E. Denny of the

Boyce Thompson Institute for Plant Research, Incorporated, and was entitled Chemical Stimulants and Their Effect upon the Growth and Metabolism of Dormant Plants. Another general address was that of Dr. P. B. Dunbar of the U. S. D. A. Food and Drug Administration on the subject of The Never-Ending Problems of the Regulatory Chemist. A third feature of special interest was a symposium on new analytical methods, at which consideration was given to methods not yet ready for formal submission to the referees and collaborators.

The incorporation of the association was reported by the secretary-treasurer, and its improved financial outlook with no outstanding debts and substantial assets received much commendation. Announcement was made, however, that sales of volume 2 of Wiley's Principles and Practice of Agricultural Analysis had been less extensive than had been hoped, and that publication of volume 3 would be deferred to a time more favorable to the appearance of an expensive treatise of this type.

Officers for the ensuing year were elected as follows: President, J. W. Kellogg of Harrisburg, Pa.; vice president, R. Harcourt of Guelph, Ontario; secretary-treasurer, Dr. W. W. Skinner of Washington, D. C.; and as a member of the executive committee, Dr. C. C. McDonnell of Washington, D. C.

Association of Land-Grant Colleges and Universities.—In addition to the general officers enumerated on page 4, the following section officers were elected at the Washington meeting, November 14–16, 1932: Agriculture, R. Y. Winters of North Carolina, chairman, J. F. Cox of Michigan, vice chairman, and W. H. Brokaw of Nebraska, secretary; engineering, S. B. Earle of South Carolina, chairman, and Paul Cloke of Maine, secretary; and home economics, Marie Dye of Michigan, chairman, and Amy Rextrew of Delaware, secretary. In the section of agriculture, the subsection of experiment station work elected U. P. Hedrick of New York, chairman, and C. P. Blackwell of Oklahoma, secretary; the subsection of extension work, C. W. Creel of Nevada, chairman, and W. A. Munson of Massachusetts, secretary; and the subsection of resident teaching, E. J. Kyle of Texas, chairman, and H. W. Nisonger of Ohio, secretary.

In the standing committees the following appointments were announced for 3-year terms: In the committee on instruction in agriculture, home economics, and mechanic arts, E. H. Shinn of Washington, D. C. (reappointment), and C. Derleth, jr., of California and Edith P. Chace of Pennsylvania vice Genevieve Fisher of Iowa and H. S. Rogers of Oregon; college organization and policy, J. A. Burruss of Virginia and J. J. Tigert of Florida (reappointments); experiment station organization and policy, E. A. Burnett of Nebraska and C. L. Christensen of Wisconsin vice D. T. Gray of Arkansas and J. H. Skinner of Indiana; extension organization and policy, W. H. Brokaw of Nebraska and W. A. Munson of Massachusetts vice C. E. Ladd of Cornell University and K. L. Hatch of Wisconsin; military organization and policy, Walter Hullihen of Delaware (reappointment) and C. W. Pugsley of South Dakota vice E. A. Burnett of Nebraska; engineering experiment stations, O. M. Leland of Minnesota (reappointment); the radio problem, Edgar Bennett of Wisconsin (reappointment) and E. A. Hitchcock of Ohio vice C. W. Pugsley of South Dakota; aeronautics, E. O. Holland of Washington (reappointment) and P. S. Donnell of Oklahoma vice A. A. Potter of Indiana; land-grant institutions for negroes, H. F. Cotterman of Maryland (reappointment); joint committee on projects and correlation of research, A. R. Mann of Cornell University (reappointment); and joint committee on publication of research, S. W. Fletcher of Pennsylvania (reappointment).

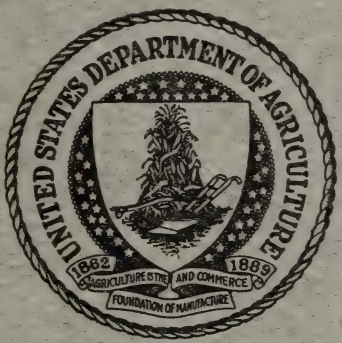
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UNITED STATES DEPARTMENT OF AGRICULTURE
OFFICE OF EXPERIMENT STATIONS

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EDITOR: HOWARD LAWTON KNIGHT

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EXPERIMENT STATION RECORD

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EDITORIAL

RESEARCH AT THE 1932 MEETING OF THE ASSOCIATION OF LAND-GRANT COLLEGES AND UNIVERSITIES

More consideration was given to the status of research at the recent meeting of the Association of Land-Grant Colleges and Universities than had been allotted to the matter for several years. The dominant issues before the convention, as set forth in the January *Record*, were those of readjustments to the prevailing economic conditions, and there was full realization that in such readjustments even seemingly firmly established institutions and policies must receive new scrutiny and study. This attitude led logically to a reexamination of the work of the experiment stations from the standpoint of their usefulness in the present emergency, and more specifically as to whether their services to agriculture and home economics might be increased by a redirection of activities with greater emphasis along economic lines. The result was an intimate discussion of accomplishments and objectives which should do much to remove any uncertainty as to the essential nature of their work and the importance of their sustained support and consistent development.

In the survey of the existing situation, cognizance was even taken of the argument sometimes encountered that the accomplishments of the experiment stations in stimulating and increasing production may have to some extent intensified the agricultural depression. In a paper entitled The Responsibility of the Agricultural Experiment Station for the Present Agricultural Situation, Director F. B. Mumford, of Missouri, vigorously combated this view, stating that the idea that the agricultural experiment stations are interested primarily in increased production is false, although the work of these institutions has increased the technical efficiency of farmers. "It is true," he stated, "that the stations have rendered a great service to farmers in demonstrating methods of production which have made it possible for the farmer to produce a bushel of grain, a pound of meat, or a pound of butter at materially less cost of labor and other factors of production. But no experiment station known to the writer has ever advocated a larger production of staple commodities

except as such larger production might contribute to the welfare of the farmer, and in any case would result in a lower production of some other commodity."

The fundamental purpose of the stations was interpreted by Director Mumford as "to aid the farmer in adjusting himself to the agricultural situation in which at any particular period he finds himself." The stations have discharged this function by helping to reduce the costs of production, and by demonstrating the advantages of standardizing agricultural commodities and improving the quality of the products marketed. In many cases they have specifically recommended decreased production for the purpose of increasing profits, as by the disposing of unprofitable dairy cows and other inferior livestock, grading farm products, and withholding those of low quality from the market. "No greater error has been committed than the assumption that the present agricultural surplus and consequent low prices are primarily due to the efficient work of the agricultural experiment stations. . . . Without the experiment stations the farmer's plight would be infinitely worse than it now is, and with the help and aid that these institutions are now organized to give, the farmer's recovery will be more rapid and his adjustment to changed conditions will be more certainly and successfully accomplished."

The necessity of continued research was upheld by various speakers, including Dr. E. G. Nourse, of the Brookings Institution; Mr. N. A. Olsen, chief of the United States Department of Agriculture Bureau of Agricultural Economics; Director C. E. Ladd, of the New York Cornell Experiment Station; and Director L. E. Call, of the Kansas Station, but the case was perhaps best presented in the report of the special committee on the agricultural situation. This phase of the report, discussed by President F. D. Farrell, of Kansas, set forth the matter essentially as follows:

"Continued research and education on a wide range of agricultural problems is necessary if agriculture is to keep pace with progress in other industries and occupations. Most of the agricultural colleges, through lack of personnel and facilities for economic research in agriculture over a sufficient period of time, are unable to provide answers to many of the economic problems that have assumed such great importance at the present time; and no State has supported economic research in agriculture sufficiently long or extensively to provide an adequate basis for intelligent action on all problems involved in the agricultural adjustments that are needed at present. To be most helpful research should be continuous, particularly through periods of depression, since it is during such periods that results are most needed. . . .

"Research programs should aim to reveal relationships between the problems of national land policies and individual farming plans, between balanced production for the needs of the Nation and a proper balance between enterprises on the individual farm, between national marketing policies and the marketing practices of the farmer, between the national policies in credit and taxation and the credit needs and tax-paying ability of the individual farmer. It should deal with the national aspects of income distribution among the various groups, the farmer's share of that income, and its most effective utilization to promote a rising standard of living in the farm home. There is need for clearer understanding of the part agriculture plays in the recurrent economic crises that beset modern industrial countries and of the influence on agricultural welfare of alternating period of prosperity and depression. . . .

"This does not at all mean that the usual agronomic, animal husbandry, dairy husbandry, horticultural, and mechanical problems are, or are likely to become, of less importance from the standpoint of research and education. In many particulars they will require even more consideration than they have in the past. It does mean that we shall need to place much greater stress upon the constantly increasing importance of economics as applied to agriculture."

The problem of readjustments in research to meet the present emergency was the subject of an address by Dr. A. F. Woods, director of scientific work of the United States Department of Agriculture, who pointed out that the economic and sociological phases of rural life should be given special attention. He discussed the situation in the various States and in the department in considerable detail, showing that quite generally in the department and the stations emphasis has been shifted to projects that are expected to furnish the basic facts from which recommendations for readjustments in agricultural operation must be derived. "During this depression as a general rule very little strictly new work except of an emergency nature has been undertaken. Funds in many instances have been concentrated on the most urgent projects, the less urgent ones being temporarily laid aside. In the department and in many of the States considerable reduction in working funds has been necessary. Salaries have in many cases been temporarily reduced and in some cases reduction in personnel has been necessary. Restrictions in travel, especially automobile mileage allowance and per diem allowance, have been rather general; also restrictions in publications. More material is being published through scientific and technical journals, the agricultural journals, the newspapers, and the radio. Material generally is being published in more condensed and popular

form. There has been a commendable effort generally to do everything possible to reduce expenditure and to get the largest returns for money expended."

The experiment station subsection gave further attention to the problem of specific economies in operation, particularly in the preparation and distribution of station publications. The report of the committee on experiment station organization and policy suggested the possibility of some savings through critical scrutiny of manuscripts, somewhat smaller editions and changes in typography and make-up, and the full utilization of scientific journals and the proceedings of societies when available and appropriate. These suggestions, however, in the committee's opinion exhausted the major opportunities in this direction, and attention was drawn to the fact, sometimes overlooked, that the entire cost of publication seldom constitutes more than a minor fraction of the entire outlay of the project of which it constitutes the final stage.

The distribution of station publications was discussed in its domestic phases by Directors B. E. Gilbert, of Rhode Island, and F. J. Sievers, of Massachusetts, and that in other countries by Mr. J. T. Jardine, chief of the Office of Experiment Stations. Director Gilbert outlined some of the difficulties confronting the stations in distributing as effectively as possible the limited editions which ordinarily must suffice, and raised for discussion such questions as the desirability of maintaining technical and popular series, the use of subject matter and other classified mailing lists, distribution on the request basis, policies as regards libraries, and the sale of publications. Director Sievers emphasized the wide diversity of conditions among the various stations as presenting a substantial obstacle to standardization of policies.

The paper of Mr. Jardine supplemented a report of the special committee on foreign mailing lists appointed by the subsection at its 1931 meeting and consisting of Mr. Jardine as chairman; Vice Director A. Boss, of Minnesota; Director Gilbert; and Director S. B. Doten, of Nevada. This report announced that data regarding agricultural research institutions had been assembled in the Office of Experiment Stations for the various foreign countries, and that with the cooperation of qualified advisers a considerable number of tentative lists had been prepared. The committee was continued with instructions to complete the lists along the lines undertaken, as well as to attempt to locate through negotiations with other countries not to exceed 75 agencies at strategic points over the globe to act as central repositories for all station and Department publications.

The possibilities of cooperative effort in extending institutional efficiency seem unusually worthy of consideration in a time of financial stringency, and, as would be expected, these aspects received much attention. Under the topic Federal and State Cooperation in Agricultural Education and Research, Doctor Woods reviewed some of the major achievements of the past, but pointed out that "we have been fairly prolific in expedients and have largely lacked a constructive national plan." Among matters needing immediate attention, he cited the speeding up of land classification, soil erosion and crop adaptation programs, the program of crop distribution with reference to local and world needs, the protection and utilization of the unappropriated public domain, a more effective agricultural information service for farmers, and better organization for production and marketing. "More than ever," he stated, "we need joint planning and effort to solve the social and economic problems that affect the welfare of our rural population and our country as a whole. . . .

"In the case of the experiment stations and agricultural extension there is provision for close Federal cooperation and administrative relation. I can say without fear of contradiction that this has been carried out without any domination on the part of the Federal Government and with a spirit of hearty compliance with the acts and regulations on the part of the States. Differences of opinion arise, but they are always composed in a friendly and cooperative spirit. National, State, and local problems are often so closely interwoven that satisfactory solutions could never be reached except by cooperation."

The report of the special committee on Federal-State relationships, headed by Dr. S. W. Fletcher, of Pennsylvania, also attested the unusually cordial relations generally prevailing between the stations and the Department. The committee recommended that as a part of the program of the 1933 meeting a special conference be arranged of directors and Department officials to consider matters of common interest.

The actual status of cooperation between the State experiment stations and the Department was summarized in the report of the joint committee on projects and correlation, presented by its chairman, Director Mumford, of Missouri. This report showed that in 1931–32 all State stations shared in cooperative undertakings of this type, the number ranging from 1 per station to as many as 43 and the total number of cooperative agreements reaching 851. These projects covered a wide variety of fields, but, according to the committee, "it appears that coordination of effort is less general in

marketing research than in the other fields originally represented by the special research committees. This fact, however, does not signify that the field is being neglected. It probably means that, for lack of funds, not enough effort is being devoted to the study of the fundamental problems of marketing. Confronted with the problem of surpluses and reduced consumption, it seems to be vitally important that the basic problems surrounding the marketing and distribution of farm products be given greater emphasis. A better understanding of marketing is needed in connection with land-use planning and readjustments of production to the realities of consumption."

Another field in which the committee saw an exceptional opportunity and need for nation-wide cooperation in research and planning is that of land utilization. "Not only will each State," the committee reported, "find it essential to develop its own land-use research program, but it will be vitally concerned with the bearing of national policies on State programs and will benefit from close articulation with the activities of the national land-use committee." As a means of stimulation of such a program, the committee recommended that steps be taken by the executive committee of the association for the formulation of a national cooperative land-use research and planning project for consideration by the individual stations, and that "approval be given to the principle of joint financial participation in the work of the national land-use research and planning committee by the State experiment stations to the extent of $100 per annum payable from State, local, or Federal funds—subject, of course, to State and Federal laws and rulings pertaining to them; that these funds be paid to the executive committee of this association to be expended by that body in developing and promoting a national program of land-use research and planning, of which State programs will form essential parts." This recommendation was adopted in turn by the section on agriculture and the executive body.

An account of a long-continued example of interinstitutional coordination of research was given by Director W. L. Slate, of Connecticut, who depicted the situation in the Northeastern States as embodied in the work of the Conference of Northeastern Experiment Station Directors. Originally instituted in 1884 as a guide to uniform requirements in fertilizer inspection, the scope of this informal organization has gradually been broadened to include most matters of regional interest, and it has become notably successful in its accomplishments in practical cooperation.

The unusual emphasis laid on the need of economic studies by no means entirely monopolized the attention of the convention in its

consideration of subject-matter phases of research. A plea for the encouragement of investigations in rural sociology as an essential part of the present-day program was presented by Dr. B. Youngblood, of the Office of Experiment Stations. Rural sociologists, he maintained, face the challenge to discover and evaluate the essentials of human advancement and to join forces with other constructive minds in the task of helping rural people to attain and enjoy them. "This challenge must be met in a spirit of fidelity to scientific processes of reasoning and of devotion to the cause of rural human achievement." As essentials to success in rural sociological research, he enumerated a more adequate methodology for the collection and analyis of social data, the establishment and presentation of a distinctive viewpoint and objectives rather than the doing of "scientific chores for the agricultural economist, the home economist, and the psychologist," and the selection of the more important problems for study. Among these problems he suggested studies of rural population, rural psychology, rural groups, and rural social pathology.

A report prepared by Miss Sybil L. Smith, of the Office of Experiment Stations, for presentation to the section of home economics, dealt with progress in home economics research receiving Federal support in land-grant institutions. This report reviewed the published contributions of the year along such lines as the feeding and clothing of the farm family, the rural home and its equipment, and standards of living of farm families. Here, too, a direct application of many of the findings to the prevailing emergency conditions demonstrated the timeliness and practical value of such studies and indicated a marked responsiveness of home economics workers to the needs of the day.

No account of the research phases of the convention would be complete without mention of the extent to which the scheduled papers were supplemented by discussions from the floor. In the experiment station subsection, general participation in the proceedings was facilitated by the ample time available for such discussions, and another stimulus was doubtless the close relevancy of most of the topics on the program to the immediate problems with which the institutions are confronted. The convention kept largely on familiar ground, and its entire program was predominantly practical and timely. This trend, however, did not obscure its vision of fundamentals, and the keen appreciation which was everywhere apparent of the necessity for a strongly sustained research on basic problems even under the stress of economic emergency was one of the most encouraging aspects of the entire gathering.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Chemical investigations of the tobacco plant.—III, Tobacco seed (*Connecticut State Sta. Bul. 339 (1932), pp. 605–651, pls. 2, figs. 6*).—The four parts into which this bulletin is divided continue the report of earlier researches (E. S. R., 65, pp. 9, 36).

I. *The nutritive properties of tobacco seed*, L. B. Mendel and H. B. Vickery (pp. 609–624).—The feeding trials with albino rats here reported have been previously noted (E. S. R., 67, p. 621).

II. *The globulin of tobacco seed*, H. B. Vickery, A. J. Wakeman, and C. S. Leavenworth (pp. 625–636).—Tobacco seed was found to contain a protein of the globulin type that could readily be prepared in crystalline form by the standard methods. The crystals were regular octahedra occasionally modified into flattened tablets of hexagonal outline.

After complete acid hydrolysis the protein yielded 1.09 per cent of histidine, 13.62 per cent of arginine, and 0.92 per cent of lysine; color tests indicated that tryptophane, cystine, and tyrosine are likewise present. The isoelectric point of the globulin was found to lie near pH 5.4. The globulin was almost completely salted out of a relatively concentrated solution by ammonium sulfate between the limits 0.7 to 1.5 M, but was soluble in saturated sodium chloride solution. On heating its solution in molar sodium chloride at pH 5.5, it was slowly and progressively denatured at temperatures higher than 77°.

III. *Some nitrogenous components of the hot water extract of fat-free tobacco seed meal*, H. B. Vickery (pp. 637–645).—A hot water extract prepared from fat-free tobacco seed was examined with respect to the forms of nitrogen it contains. "Approximately 60 per cent of this nitrogen was accounted for in terms of well-recognized nitrogenous groupings and nearly 9 per cent was isolated in the form of pure crystalline substances. It seems certain that a large part of the unknown forms of nitrogen is contained in basic substances many of which contain nitrogen in cyclic structures."

IV. *A microchemical study of the seed of Nicotiana tabacum*, F. A. McCormick (pp. 646–650).—Microchemical tests were made, in part upon material fixed in several of the usual reagents, and cut in paraffin, in part upon seeds embedded in paraffin without previous killing and fixing.

"The seeds of *N. tabacum* contain no starch. There is starch in the ovule and it develops very early in the hypocotyl of the young seedling.

"Both endosperm and embryo contain an abundance of protein. The difference in size of the protein granules in these two parts and the difference in reaction to the tests suggest that there may be a chemical difference." The amount of protein in the raphe was found to be small.

"There is present both in endosperm and embryo a large amount of fat, which only appears in globules after the microchemical tests have been applied."

Mannose and the first sugar of photosynthesis, H. F. Clements (*Plant Physiol., 7 (1932), No. 3, pp. 547–550*).—Mannose was shown by the author of

this contribution from the State College of Washington not to be present in the leaves of 42 species of plants.

"Since mannose arises from glucose together with fructose in alkaline solutions, and since mannose is not present in leaf sap, it is concluded that fructose does not arise from glucose in plants but that its origin is simultaneous with that of glucose. By eliminating the pentoses, mannose, and sucrose as sugars not always present when photosynthesis is in progress, it seems probable that glucose and fructose are together the first sugars of synthesis in green leaves."

Vegetable amylases: Study of diastase action in the absence of maltose, A. S. SCHULTZ and Q. LANDIS (*Jour. Amer. Chem. Soc., 54 (1932), No. 1, pp. 211–220, figs.* 7).—The diastatic action of certain vegetable amylases was found to be (in the absence of such inhibitive agencies as maltose, irreversible adsorption on interfaces due to shaking or on diatomaceous earth or filter paper pulp) a linear function of time and enzyme concentration throughout large variations in substrate concentration. Such adsorptive agents as extended liquid-vapor surface films caused by continued shaking, diatomaceous earth, or filter paper pulp were found to have marked inhibitive effects. The initial presence of small amounts of saponin, gelatin, albumin, casein, or peptone prevented this inhibition, however. Glycine and agar were found ineffective. Unpurified, ground soybean diastase appeared not to be subject to adsorption at the liquid-vapor surface films caused by shaking.

A convenient method for the study or determination of diastatic activity is described. The sugars were fermented out by yeast as rapidly as formed, and the resulting carbon dioxide was collected and measured at frequent intervals. The Michaelis constant for a flour diastase was determined as about 0.25 in terms of percentage substrate concentration.

Rye germ oil, A. W. STOUT and H. A. SCHUETTE (*Jour. Amer. Chem. Soc., 54 (1932), No. 8, pp. 3298–3302*).—The sample of rye germ oil of which the examination and analysis are reported in this contribution from the University of Wisconsin was found to be a semidrying oil characterized by the quantity of heavily pigmented unsaponifiable matter which it contained. The percentage composition was found to be as follows: Myristin 2.33, palmitin 8.11, stearin 0.18, olein 31.92, linolein 44.05, linolenein 4.99, unsaponifiable matter 7.28, and undetermined 1.14.

The germicidal activity of vapors from irradiated oils, R. S. HARRIS, J. W. M. BUNKER, and N. A. MILAS (*Jour. Bact., 23 (1932), No. 6, pp. 429–435*).—It is shown in a contribution from the Massachusetts Institute of Technology that the vapors of certain oils (of which 29 varieties were examined) inhibit or kill bacterial smears on nutrient agar, some of the oils exhibiting this property without irradiation with ultra-violet light whereas others showed it only after such treatment. This germicidal action is regarded as presumably due to volatile substances containing peroxidic-oxygen, the formation of such compounds being accelerated by ultra-violet irradiation.

In general, animal oils were found more active than vegetable oils. *Bacillus subtilis* and *Clostridium sporogenes* were more resistant to this treatment than were *Streptococcus epidemicus, S. lactis, Staphylococcus pyogenesaureus, Sarcina lutea, Escherichia coli, Eberthella typhi, Serratia marcescens, Aspergillus niger,* or *Saccharomyces anomalus.*

The isolation of carotene, H. N. HOLMES and H. M. LEICESTER (*Jour. Amer. Chem. Soc., 54 (1932), No. 2, pp. 716–720*).—The authors of this contribution from Oberlin College determined the carotene content of a number of vegetables, and developed a method found to be not only rapid but cheaper than the cus-

tomary procedures for obtaining a solution of carotene and xanthophyll free from chlorophyll and for the isolation of carotene in good yield from canned carrots. The material consisted of canned carrots, which were first subjected to a pressure of 8,000 lbs. per square inch, then treated for from 8 to 10 hours with acetone, filtered off and again pressed as before, treated with acetone for about half an hour, filtered off, extracted with petroleum spirit, and finally extracted further with acetone and with petroleum spirit again. "This alternation of solvents was used because it was found that less total volume of solvent had to be employed than if either had been used alone. Also, by dissolving the acetone extracts in the petroleum ether and washing the solvent out with water, the pigment it carried was transferred to the latter solvent and less time was consumed during evaporation."

Vitamin A from fish liver oils [trans. title], P. KARRER, R. MORF, and K. SCHÖPP (*Helvetica Chim. Acta, 14 (1931), No. 5, pp. 1036–1040*).—The authors have prepared a vitamin A concentrate from the livers of Hippoglossus as follows:

The livers were first extracted with low boiling petroleum ether, the extract saponified with 12 per cent alcoholic potassium hydroxide in an atmosphere of nitrogen at 60° C., and the unsaponifiable fraction dissolved in hot methyl alcohol and allowed to stand at —15° until the sterols crystallized. The filtrate was concentrated, allowed to stand in the cold again for further removal of traces of sterols, and then diluted with water and extracted with low boiling petroleum ether. On evaporation of the solvent the unsaponifiable fraction was left as a light brown oil with a vitamin A activity of from 5,000 to 6,000 cod-liver oil units, as determined by the antimony trichloride test. The extract was purified further by dissolving in methyl alcohol and cooling in a mixture of solid carbon dioxide and acetone. A flocculent or sticky precipitate separated, which was removed by filtration at —60° or centrifugation. On repeating the extraction process with water and low boiling petroleum ether a light yellow oil separated, which gave a much stronger reaction, 8,000 cod-liver oil units.

A further purification was effected by fractional adsorption of the petroleum ether extract on alumina in a vertical tube. The middle fraction, after extraction with petroleum ether and separation by water and methyl alcohol as before, had an activity of 9,100 cod-liver oil units. A second fractionation increased the activity to 10,500 units. This fraction was tested biologically by Von Euler, who reported that 0.005 mg daily was sufficient as the sole source of vitamin A for normal growth of rats. This activity is stated to be 10 times that of carotene and of biosterin.

The concentrate contained from 83 to 84 per cent carbon and 10.5 per cent of oxygen and had a molecular weight of 320. It was reduced slowly, with slight loss of action, by aluminum amalgam in ether, resisted catalytic reduction, and was oxidized by ozone and potassium permanganate, yielding geronic acid and acetic acid, respectively, thus indicating the presence of β-ionone and the

$$\begin{array}{c} CH_3 \\ | \\ =C—C= \end{array}$$

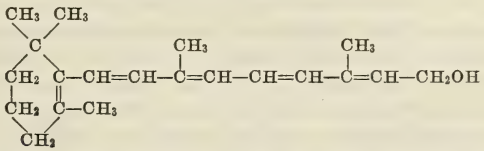
group, respectively. With concentrated sulfuric acid an intense reddish violet color resulted, resembling that with dihydrocrocetin and indicating the presence of six conjugated double bonds.

Highly concentrated vitamin A preparations [trans. title], H. VON EULER and P. KARRER (*Helvetica Chim. Acta, 14 (1931), No. 5, pp. 1040–1044, figs. 3*).—Several vitamin A concentrates prepared from livers of a species of flounders,

Hippoglossus hippoglossus, were compared biologically and with the antimony trichloride test. The values obtained by the two methods did not always run parallel. The preparations were characterized by absorption bands between 316 and 328 mμ. A concentrate from the liver of mackerel, *Scombresox saurus*, gave an absorption band with two maxima at 318 and 331 mμ.

Vitamin A from fish liver oils, II [trans. title], P. Karrer, R. Morf, and K. Schöpp (*Helvetica Chim. Acta, 14 (1931), No. 6, pp. 1431–1436*).—The unsaponifiable fraction of mackerel oil described by Von Euler and Karrer, as noted above, has been concentrated by the method described in the first paper of the series. The purified fraction contained 83.7 per cent of carbon and 10.5 per cent of hydrogen. These values are thought to harmonize with the formula $C_{20}H_{30}O$ or $C_{22}H_{32}O$.

The substance is an alcohol capable of forming esters which are soluble with difficulty in methyl alcohol at 20°C. The acetate was prepared by the action of acetic anhydride on the concentrate dissolved in pyridine and could be recovered from the ester by saponification with alcoholic potassium hydroxide at 60°. The recovered concentrate gave the same analysis as before. Further study of the purified concentrate showed it to be optically inactive and to have a molecular weight of between 300 and 320. On oxidation with ozone it yielded geronic acid, and with potassium permanganate acetic acid corresponding to 10.5 and 15.8 per cent, respectively, of methyl carbon. On the basis of these reactions, the following structural formula is proposed:



This corresponds with the empirical formula $C_{20}H_{30}O$, while for the alternative formula $C_{22}H_{32}O$ an additional CH=CH is introduced into the side chain immediately before the CH_2OH group.

The authors conclude that fish liver oils contain a polyene which has the same carbon ring system as carotene and a similar aliphatic side chain, and that this polyene is responsible, in part at least, for the strong blue color of such oils with antimony trichloride. The general parallelism between the Lovibond color numbers of cod-liver oils and their growth-promoting properties is thought to indicate that this polyene is a growth factor. Whether it alone is responsible for the vitiman A action of liver oil remains to be determined.

The oxidation of vitamin A in vitro: Influence of the solvent, W. J. Dann (*Biochem. Jour., 26 (1932), No. 3, pp. 666–678, figs. 7*).—The conflicting literature on the oxidative destruction of vitamin A is reviewed, and data are reported on its stability in various solvents treated as follows:

About 150 mg of a crude cod-liver oil concentrate giving a color reaction of about 100 blue units per milligram in the antimony trichloride test was transferred to a 100 cc round bottomed flask and weighed, enough of the solvent added to make a solution containing 1 per cent by weight of the concentrate, and the flask warmed and shaken until the concentrate dissolved. After a 1 c c sample of the solution had been withdrawn by pipette for colorimetric measurements of its vitamin A content, the flask was fitted with a reflux condenser provided with an inlet tube through which a rapid current of dried air could be passed. The flask was then immersed in a boiling water bath and heated with a constant stream of air through the contents. At intervals a 1 c c sample was removed for vitamin A determinations. The vitamin was

separated from the sample by appropriate means and dissolved in 2 c c of chloroform for the usual antimony trichloride test.

The stability of the vitamin to oxidation by air was found to depend upon the solvent. It was particularly stable in ethyl alcohol, alcoholic potassium hydroxide, and ethyl acetate. In ethyl alcohol it was also stable toward hydrogen peroxide. The various solvents used and the percentages of dissolved vitamin A destroyed by aeration for one hour at 98° C. were as follows: Ethyl, *n*-butyl, and cetyl alcohols, 0 per cent; *n*-amyl alcohol, 22; acetic acid, 89; caproic acid, 54; lauric acid, 93; stearic acid, 94; oleic acid, 92; ethyl acetate, 0; ethyl laurate, 67; ethyl stearate, 87; ethyl oleate, 81; *n*-amyl acetate, 23; triacetin, 0; tributyrin, 31; triolein, 36; coconut oil, 29; arachis oil, 60; and 20 per cent alcoholic potassium hydroxide, 0 per cent.

The results obtained in the antimony trichloride test were verified in the more important cases by biological tests.

In view of these results, special precautions to prevent oxidation of vitamin A during the saponification are considered superfluous. It is noted that ethyl alcohol has already been used successfully for the preservation of vitamin A concentrates for several weeks. It is thought that the slow loss in potency over a period of months may be due to isomerization rather than oxidation.

The chemical nature of vitamin C, J. L. Svirbely and A. Szent-Györgyi (*Biochem. Jour., 26 (1932), No. 3, pp. 865–870, figs. 2*).—This is the complete report, with experimental data, of the investigation noted from preliminary reports (E. S. R., 67, p. 649) and leading to the conclusion that vitamin C is identical with hexuronic acid as obtained from ox suprarenal glands.

The antiscorbutic fraction of lemon juice, X, S. W. Johnson and S. S. Zilva (*Biochem. Jour., 26 (1932), No. 3, pp. 871–888, figs. 6*).—In this continuation of the series of papers noted previously (E. S. R., 65, p. 503), evidence is reported leading the authors to conclude that the phenomenon noted in an earlier paper of the series (E. S. R., 62, p. 803) of an increased rate of destruction during autoclaving and storage in a neutral medium of vitamin C and the reducing principle thought to accompany it is due to the formation during the autoclaving of a destructive substance or substances from the sugar of the juice. This substance is thought to be related to catechol.

The determination of vitamin D, I–III (*Biochem. Jour., 26 (1932), No. 2, pp. 488–530, pl. 1, figs. 8*).—The three papers noted below describe the results of work undertaken on behalf of the accessory food factors committee of the Lister Institute and Medical Research Council, Great Britain.

I. *The relationship between graded doses of a standard solution of vitamin D, administered to young rats on a rachitogenic diet, and the ash content of their bones,* E. M. Hume, M. Pickersgill, and M. M. Gaffikin (pp. 488–505).—This paper describes in considerable detail the construction of a scale correlating doses of a standard solution of irradiated ergosterol (the international standard for vitamin D) administered as a prophylactic, with the percentage ash in the dried fat-free bones of young rats on a rachitic diet. The scale is designed to serve for this test in the same way as similar scales constructed by Bourdillon et al., and by Everse and Van Niekerk (E. S. R., 68, p. 133) for the X-ray method, and by Bills et al. (E. S. R., 65, p. 595) and Dyer (E. S. R., 67, p. 345) for the line test. The application of the scale to the evaluation of unknown substances for vitamin D is discussed, but no attempt has thus far been made to evaluate any unknown substances against the scale.

II. *A comparison of radiography and bone analysis in the estimation of vitamin D,* R. B. Bourdillon and H. M. Bruce (pp. 506–521).—This comparison is based on the results obtained in radiographing the 180 rats of the

preceding study and 200 other rats, bone analyses of which were made by Zilva et al. The method followed in the radiographic work was essentially the same as described in the report of Bourdillon et al (E. S. R., 68, p. 133) except that a prophylactic scale was required which was constructed on lines similar to the curative one.

The report consists largely of a comparison of the errors in estimating vitamin D by radiographic and bone analyses, with the general conclusion that "while the error in determination of the resultant effect is considerably greater with the radiographic scale than with bone analysis, the total error of a test with any given number of rats appears roughly equal in the two methods provided that the doses of vitamin are confined to the more limited range of the radiographic method. Owing to the decreased labor of the radiographic method it is easy to use a larger number of rats, and so to get greater accuracy than with bone analysis."

It is emphasized, moreover, that the choice between curative and prophylactic dosage should depend on the method of detecting the results. Bone analyses are considered more satisfactory with the prophylactic than curative technic and the line test more satisfactory with the curative. In regard to radiography, the advantages of the two methods are thought to be more evenly balanced, although it is conceded that the prophylactic radiographic scale is less satisfactory than the curative scale.

III. *The stability of preparations of vitamin D*, R. B. Bourdillon, H. M. Bruce, and T. A. Webster (pp. 522–530).—Exhaustive tests by direct and indirect methods are reported on the stability under different conditions of various preparations of vitamin D, for the most part 0.01 per cent solutions in olive oil of irradiated ergosterol used as the standards for vitamin D first issued as the Medical Research Council standard and later the international standard (E. S. R., 66, p. 690). The first of five standards was prepared in February, 1927, and the last in January, 1931, and most of the tests were made during 1931. Some of the solutions were kept in stoppered bottles at 0° C. and others at room temperature until used. Tests were also made of impure crystalline vitamin D and of calciferol after heating for several days at varying temperatures up to 100°, duplicate tests being run with samples kept at —4° until used.

No deterioration of the samples kept at 0° or below was noted in the time covered by the experiment, but there was marked deterioration in samples kept at room temperature for periods of a year or more. In the heated samples there was marked destruction, with considerable variation between the different samples. The rate of deterioration at the higher temperatures was used to estimate the probable destruction of vitamin D at 0° after prolonged storage, with the tentative conclusion that "preparations at 0° may lose half their activity in about three years, but there is some reason to think that the solidification of the oil has a preservative effect and that the stability at 0° may be greater than the experiments suggest."

A few tests were also made of the stability at 40° for a period of 29 days of one of the standard solutions to which had been added various substances which might possibly be present as contaminants. Aside from the solution containing sulfur, which showed rapid deterioration, no change in stability was noted as a result of the presence of impurities.

Methyl red as an adsorption indicator, G. Batchelder and V. W. Meloche (*Jour. Amer. Chem. Soc., 54 (1932), No. 4, pp. 1319–1323, fig. 1*).—A contribution from the University of Wisconsin describes a precipitation titration of sulfate by means of barium chloride.

"Although this procedure is not satisfactory for the quantitative determination of sulfate, it has been used, together with a more precise fluoride titration, to illustrate a different application of methyl red to adsorption titrations. Methyl red is described as an acid indicator which detects the change of pH at the end-point of two precipitation titrations. This change of pH was attributed to adsorption during the titrations."

Effect of ultrasonic radiation on indicators, S. LIU and H. WU (*Jour. Amer. Chem. Soc., 54 (1932), No. 2, pp. 791–793*).—Unbuffered solutions of 12 indicators saturated with air or oxygen showed color fading when exposed to ultrasonic radiation. Buffered solutions gave the same result. The color of gas-free solutions and that of solutions saturated with hydrogen did not fade when so exposed. "These observations show that indicator molecules are permanently destroyed by oxidation under the influence of ultrasonic radiation."

The use of the antimony electrode in the electrometric estimation of magnesium, B. B. MALVEA and J. R. WITHROW (*Jour. Amer. Chem. Soc., 54 (1932), No. 6, pp. 2243–2247, figs. 2*).—The antimony electrode made of commercial stick antimony was shown in a trial of which this report is a contribution from the Ohio State University to be a satisfactory substitute for the hydrogen electrode in the electrometric estimation of magnesium in its salts and in mixtures of calcium and magnesium salts. The presence of calcium to the extent of from 8 to 25 times the quantity of magnesium was found permissible. The minimum concentration of MgO was 0.1 g in 150 c c of solution, however; and "at low dilutions the results were unsatisfactory if calcium was present in any appreciable amount, or was even equivalent in amount to the magnesium."

The precision with which the concentrations of solutions of hydrochloric acid and sodium hydroxide may be determined with the immersion refractometer, E. R. WASHBURN and A. L. OLSEN (*Jour. Amer. Chem. Soc., 54 (1932), No. 8, pp. 3212–3218*).—The refractive indices for hydrochloric acid solutions up to 4 N and for sodium hydroxide solutions up to 3 N were determined by the authors of this contribution from the University of Nebraska at 20, 25, and 30°, and equations relating normalities to refractive indices for these solutions were formulated.

"Several precautions which must be taken in order to obtain precision results with the immersion refractometer have been studied. The limits of precision with which one may expect to determine the concentrations of these solutions by this method have been determined."

Errors involved in the determination of minute amounts of sodium by the magnesium uranyl acetate method, E. R. CALEY (*Jour. Amer. Chem. Soc., 54 (1932), No. 2, pp. 432–437*).—Experiments on pure solutions and on commercial samples have shown, in general, that small amounts of sodium may be determined satisfactorily by the direct magnesium uranyl acetate method as long as the amount present does not fall below 0.2 mg. Lesser weights were found to be determinable in special cases by the use of unusually small volumes of solution and reagent; but the use of a more concentrated reagent led to high results with the usual procedure and was not helpful in the quantitative precipitation of minute quantities of sodium.

The indirect volumetric determination of sodium based on the reduction and titration of the uranium in magnesium sodium uranyl acetate, N. H. FURMAN, E. R. CALEY, and I. C. SCHOONOVER (*Jour. Amer. Chem. Soc., 54 (1932), No. 4, pp. 1344–1349*).—The authors of this contribution from Princeton University found it possible to determine indirectly the sodium present in triple sodium magnesium uranyl acetate by reduction and titration

of the uranium. The method appeared to offer advantages over other methods in respect to accuracy when quantities of sodium less than 10 mg were to be determined.

"The volumetric method gives significant evidence of the constancy of composition of the precipitates obtained from amounts of sodium ranging from 0.01 to 0.02 g. Although the percentage of UO_2 is somewhat higher than the theoretical value in precipitates of small weight, the ratio of sodium to uranium in these precipitates appears to be constant in the range studied."

The uranium solution, at room temperature, was passed through a Jones reductor. The reduced solution was stirred for five minutes while a rapid stream of air was passed through. "The end of this process may be determined potentiometrically, although this is not necessary." A measured excess of standard ceric sulfate was added, and the solution was stirred vigorously for five minutes. The excess of the oxidant was then determined by back-titration with standardized ferrous sulfate solution.

Note on the determination of exchangeable sodium in soils, R. WILLIAMS (*Jour. Agr. Sci.* [*England*], *20* (*1930*), *No. 3, pp. 355–358*).—The author of this contribution from the University College of North Wales discusses the application of the zinc uranyl acetate method to the determination of exchangeable sodium in soils, and presents a procedure for estimating sodium in acetic acid extracts. Results for a number of typical nonsaline Welsh soils are given.

With the use of this method good agreement between the exchangeable sodium extracted by 0.5 N acetic acid and that extracted by N ammonium chloride was obtained.

Determination of the rate of decomposition of organic matter under field conditions, M. B. STURGIS (*Soil Sci., 34* (*1932*), *No. 1, pp. 19–23*).—As a means of determining as reducing sugars the carbohydrate content of the soil, "the following method gave [at the Louisiana Experiment Station] somewhat low but consistent results:

"The soil material remaining after the ether and alcohol extractions was dried and a 20-g sample taken. The sample was placed in a 500-c c glass-stoppered Erlenmeyer flask and moistened with 5 c c of 18 per cent hydrochloric acid. Then 25 c c of 72 per cent sulfuric acid was pipetted into the flask, care being taken to wash all the soil material to the bottom; the glass stopper was lubricated with the sulfuric acid, placed in the flask, and weighted down against the pressure. The pressure of HCl will be from 20 to 30 mm above atmospheric pressure. The flask was rotated to mix completely the acids and sample and quickly placed in a water bath at 20° C. After 24 hours, the contents of the flask were diluted with 300 c c of water and boiled under a reflux condenser for 1 hour. The solution was filtered through a Gooch crucible and the lignin-humus residue washed free of acids. The iron, aluminum, and manganese were precipitated from the filtrate with sodium carbonate and sodium hydroxide. Two precipitations were necessary. Sodium carbonate was added to the solution until precipitation began, then a 10 per cent solution of sodium hydroxide was added to bring the solution up to pH 6. The mixture was made up to 400 c c and filtered through a Büchner funnel provided with a filter paper and asbestos mat. Sodium hydroxide solution was then added to the filtrate until the mixture was very slightly alkaline, pH 9.

"The volume of the alkaline solution used in the second precipitation was noted and added to the original volume of 400 c c in the calculation. A second filtration was made, using a new filter paper and mat. Reducing sugars were then determined as anhydrous dextrose on the clear, slightly alkaline filtrate

by the method of Lane and Eynon [E. S. R., 49, p. 310] for the determination of reducing sugars by means of Fehling's solution with methylene blue as an internal indicator. Very low concentrations required that the method be modified for the use of 2 c c of Fehling's solution, and that a table of factors and dextrose values be made for the conditions of the determination."

Determination of the inorganic nitrogen in the corn plant by the expressed sap method, R. W. GERDEL (*Plant Physiol., 7 (1932), No. 3, pp. 517–526*).—The author of this contribution from the Ohio Experiment Station found the Sessions and Shive aspiration method (E. S. R., 63, p. 23) satisfactory for the determination of inorganic nitrogen in plant sap, although slight modifications in quantity of reagent and time of aspiration were necessary for the determination of the inorganic nitrogen content of corn sap. It was found also advantageous to substitute 300-c c Kjeldahl flasks for the Florence flasks used in the original procedure, the rounded bottom of the Kjeldahl flask permitting the aspiration tube to come more nearly into contact with the Devarda alloy so that more of the alloy was held in suspension. The long neck of the Kjeldahl flask also provided more room for the expansion of the foam (not entirely suppressed by the use either of paraffin oil or of caprylic alcohol) produced from leaf tissue sap. The total inorganic nitrogen content of the corn plant was found to be determinable from an analysis of an aliquot of expressed sap.

"Because of the extreme variation in nitrate nitrogen content of the separate parts of the corn plant, proper preparation of the sample for analysis is important. Sampling of a series of replicates should be done on the same day to avoid variations in the nitrate nitrogen content caused by changes in climatic factors. Expressed sap samples can be preserved for a time by the use of toluene or by freezing at —20° C. The latter method is preferred."

Determination of starch in plant tissues, R. L. SHRINER (*Plant Physiol., 7 (1932), No. 3, pp. 541–546*).—The determination of starch by the method described in this contribution from the University of Illinois involves (1) the conversion of the starch into glucose and maltose by the action of taka-diastase; and (2) the determination of the combined reducing value of the glucose plus maltose by the Shaffer-Hartmann (E. S. R., 45, p. 111) modification of the Munson-Walker method. A simplified method of calculating the starch content from these data is given.

[Detection of the bitter substance from bitterweed in milk] (*Tennessee Sta. Rpt. 1931, p. 35*).—A qualitative color test developed by M. B. MacDonald and N. D. Weathers for detecting the presence of the bitter principle of bitterweed in milk is described briefly.

The determination of iodine in butterfat, H. A. A. AITKEN (*Jour. Amer. Chem. Soc., 54 (1932), No. 8, pp. 3268–3271, fig. 1*).—The iodine content of butterfat (0.4 microgram, with not more than 5 per cent error) could be determined by igniting a relatively small sample (25 g) with caustic potash, extracting the iodide from the resulting potassium carbonate with alcohol, and estimating the iodine by microtitration, using a standard thiosulfate solution. Full manipulative detail is given.

AGRICULTURAL METEOROLOGY

Climatology of the free atmosphere, A. WAGNER (*Handbuch der Klimatologie*, edited by W. KÖPPEN and R. GEIGER. *Band I, Teil F, Klimatologie der Freien Atmosphäre. Berlin: Borntraeger Bros., 1931, vol. 1, pt. F, pp. [3]+70, figs. 8*).—This is a part of what is planned to be a 5-volume treatise on climatology.

Mathematical climatology and astronomical theory of climatic variations, M. MILANKOVITCH (*Handbuch der Klimatologie,* edited by W. KÖPPEN and R. GEIGER. *Band I, Teil A, Mathematische Klimalehre und Astronomische Theorie der Klimaschwankungen. Berlin: Borntraeger Bros., 1930, vol. 1, pt. A, pp. IV+176, figs. 25*).—This is a part of what is planned to be a 5-volume treatise on climatology.

Climate of East Indian and adjacent regions, C. BRAAK (*Handbuch der Klimatologie,* edited by W. KÖPPEN and R. GEIGER. *Band IV, Teil R, Klimakunde von Hinterindien und Insulinde. Berlin: Borntraeger Bros., 1931, vol. 4, pt. R, pp. [4]+125, figs. 31*).—This is a part of what is planned to be a 5-volume treatise on climatology.

Climatological data for the United States by sections [May—June, 1932] (*U. S. Dept. Agr., Weather Bur. Climat. Data, 19 (1932), Nos. 5, pp. [201], pls. 2, figs. 5; 6, pp. [202], pls. 2, figs. 5*).—These numbers contain the usual brief summaries and detailed tabular statements of climatological data for each State.

Climate of British Columbia: Report for 1931, F. N. DENISON (*Victoria: Brit. Columbia Dept. Agr., 1932, pp. 30*).—This report gives the monthly and annual temperature, precipitation, sunshine, and relative humidity reported by over 200 meteorological stations in British Columbia for the year 1931 and a more detailed summary of weather conditions for the year in Vancouver, Victoria, and Prince Rupert. The averages are given for each station where ten or more years' observations have been made. "The precipitation during 1931 was generally above average on the Pacific Slope of this Province and below in the Okanagan and parts of Kootenay. The temperature was above the average during January and February and for the entire year usually slightly above the average."

Monthly Weather Review [May—June, 1932] (*U. S. Mo. Weather Rev., 60 (1932), Nos. 5, pp. 117–132, pls. 10; 6, pp. 133–146, pls. 6*).—These numbers contain detailed summaries of climatological data and weather conditions, solar and aerological observations, observations on weather on the Atlantic and Pacific Oceans, and bibliographical and other information.

Meteorological observations [July—August, 1932], C. I. GUNNESS and F. R. SHAW (*Massachusetts Sta. Met. Ser. Buls. 523–524 (1932), pp. 4 each*).—The usual summaries are given of observations at Amherst, Mass., with brief notes on the more significant features of the weather of each month.

Precipitation maps of Nebraska, C. L. DOW (*Geogr. Rev., 22 (1932), No. 3, pp. 457–463, figs. 4*).—Maps which show general annual distribution, monthly and seasonal distribution, and distribution of annual maxima and minima of rainfall in Nebraska and contain certain new features are discussed with reference to the relation of rainfall to crop production.

It is shown that the annual isohyet of 20 in. passes approximately through the center of the State. The mean annual precipitation ranges from about 16 in. in the western part of the State to 35 in. in the eastern part, with a hypothetical median isohyet of 25 in. "In the eastern part of the State methods of agricultural procedure adapted to humid conditions prevail. On the uplands of western Nebraska vast tracts of land are tilled by dry-farming methods. In the central part of the State every graduation between the two is found. In this portion exists considerable maladjustment, some of which might be remedied by practical application of increased knowledge of rainfall distribution." The supremacy of the northeastern section of the State in corn production has been attributed to topography, but the maps suggest that it may be due to the summer northward migration of the maximum rainfall. The maps

also show, contrary to common belief, that May and not June is the rainiest month of the year.

The underground water level and its relation to the drought of 1930, K. Ver Steeg (*Science, 76 (1932), No. 1965, pp. 194, 195*).—The author presents data on ground water and lake levels in Ohio, showing that, although the rainfall was normal after April, 1931, the ground water sank steadily from April, 1930, until the fall of 1931, indicating that even a series of rains may have no immediate effect on the ground-water level.

Drought frequency and intensity in Utah, W. B. Hales (*Utah Acad. Sci. Proc., 9 (1931–1932), pp. 61–64*).—Using the Henry definition of drought, namely, "drought is considered to exist whenever the rainfall for a period of 21 days or longer is less than 30 per cent of the average for the time and place," and S. Marcovitch's drought index, "$I=\left(\frac{L}{R}\right)^2$, where L is the total normal of two or more consecutive days with temperatures above 90° for the months of June, July, August, and September and R is the total summer rainfall for the same months," the author determines and compares the droughtiness of different parts of Utah over a period of 18 years.

Rainfall predictions for California, season of 1931–1932, W. L. Jepson (*Madroño, 2 (1932), No. 8, pp. 71, 72*).—Attention is called to the fact that predictions by G. F. McEwen and A. F. Garton, based on preceding higher water temperatures off shore, that the winter of 1931–32 in southern California would be dry were not verified. Reference is also made to a study, by H. B. Lynch, of rainfall and stream run-off in southern California since 1769, which indicates that the low point in the present long-period series of drought years has not yet been reached.

Rainfall reliability in Australia, J. Andrews (*Linn. Soc. N. S. Wales, Proc., 57 (1932), pt. 1–2, pp. 95–100, figs. 3*).—This article discusses from the viewpoint of the agriculturist and pastoralist "(1) the amount of rain which might be expected during any season, and (2) the degree of probability of obtaining it." The conclusions reached are that there is considerable uniformity in rainfall reliability over the continent. Contrary to opinions generally held, the interior has a considerable degree of reliability, notably greater than that of the eastern plains. The reasons for the opposite view are briefly explained.

Some notes on Queensland droughts, J. K. Murray (*Roy. Soc. Queensland, Proc., 43 (1931), pp. 76–83*).—This article briefly discusses losses due to drought in Queensland, especially those of 1900–1902, and their causes and mitigation by such means as increasing the water supply, making more efficient use of feeds, improving transportation of stock, and extending weather forecasts.

SOILS—FERTILIZERS

An introduction to the scientific study of the soil, N. M. Comber (*New York: Longmans, Green & Co.; London: Edward Arnold & Co., 1932, 2. ed., pp. 208, figs. 23*).—This differs from the first edition (E. S. R., 59, p. 113) in that the section on soil microbiology has been somewhat enlarged, a section on mechanical analysis has been rewritten in accordance with the results of recent developments, and other parts of the book have been brought up to date

[Soil and fertilizer notes], W. H. MacIntire, H. P. Ogden, and B. D. Drain (*Tennessee Sta. Rpt. 1931, pp. 12, 35–37, 55, 56*).—The failure of an attempt to use coal dust as a fertilizer, analyses of lysimeter leachings, the effect of barium fluosilicate on the availability of soil sulfates, and fertilizer tests at the Mericourt Substation are briefly noted.

[Soil investigations at the Utah Station] (*Utah Sta. Bul. 235 (1932), pp. 34, 35, 38–40, 41, 54, 55, figs. 2*).—Experimental work for the biennium ended June 30, 1932, yielded data as to soil nitrates and moisture as affecting the yield and protein content of the wheat, the effect of various quantities of irrigation water and barnyard manure on corn and on the soil, the effect of fertilizers on the yield and composition of crops and on soil properties in a highly calcareous soil, determination of alkali in soils of the muck soil drainage area, factors influencing bacterial activities of the soil, and permanent fertility studies.

A new manometric apparatus for the mechanical analysis of soils and other disperse systems, A. N. Puri (*Soil Sci., 34 (1932), No. 2, pp. 115–121, fig. 1*).—The author describes an adaptation of the differential liquid manometer to the measurement of the relative density of parallel columns of water and soil suspension, the manometer containing a mixture of aniline and benzene (about 4+1, of a density slightly greater than that of water) as the heavier, and water as the lighter, liquid. The manner of setting up and manipulating the device is detailed, and its construction is indicated in a figure.

Soil Survey of Iowa.—Reports 66–68 (*Iowa Sta. Soil Survey Rpts. 66 (1932), pp. 62, pls. 2, figs. 17; 67, pp. 72, pl. 1, figs. 32; 68, pp. 64, pl. 1, figs. 20*).—These reports continue the series previously noted (E. S. R., 65, p. 17), dealing, respectively, with Lyon, Buchanan, and Union Counties, and supplementing the Federal soil surveys (E. S. R., 65, p. 208; 66, p. 13).

Soil survey of the Milk River area, Montana, W. DeYoung et al. (*U. S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpt.], Ser. 1928, No. 22, pp. 35, pls. 2, fig. 1, maps 2*).—The Milk River area, comprising 624,000 acres and forming parts of each of four counties in the northern part of the State, includes, for the most part, rather level valley lands, with some level to undulating benches and rough land.

The 19 types, here assigned to 8 series, which were mapped in the survey include Bowdoin clay, amounting to 15.5 per cent of the total soil area, and Scobey gravelly loam, occupying 10.3 per cent, as the most extensive types found. The unclassified materials consist of 14.4 per cent of rough broken land and 5.1 per cent of river wash.

The " red hill " soils of western Oregon, C. V. Ruzek and W. L. Powers (*Oregon Sta. Bul. 303 (1932), pp. 20, figs. 6*).—The red hill soils occupying the major area in western Oregon are rather heavy textured though friable, are usually well drained, can be worked early, and in general do not erode seriously. Chemically, these soils were shown by analyses to be distinctly acid and to have a low content of available phosphorus and calcium and a limited total supply of sulfur. The nitrogen and organic matter supply is described as moderate.

In field, laboratory, and greenhouse tests, the use of lime was found to be fundamental to the successful growing of soil-building legumes. Also, "the building up and maintenance of an adequate supply of organic matter of a high nitrogen content is necessary, owing to the type and distribution of rainfall. Crop rotation requires little cash outlay and is essential for continued high yields with a decrease in the unit cost of production. Field crops on these soils give definite and usually profitable increases in yield from the use of soluble phosphate fertilizers. Previous treatment with lime and manure increases the efficiency of soluble phosphate applications. The use of land-plaster or calcium sulfate for legumes is an established practice and supplies both sulfate and calcium. It is regarded a safer practice than the use of elemental sulfur on these acid soils."

Soil survey (reconnaissance) of St. Croix Island, Virgin Islands, J. THORP (*U. S. Dept. Agr., Tech. Bul. 315 (1932), pp. 28, pl. 1, fig. 1, map 1*).—St. Croix Island is divided physiographically into two mountainous areas, a coastal plain section and a tract of hilly lands. The area surveyed amounted to 52,480 acres. Drainage was found to range from excessive to very poor.

The soils of this area are here listed as 20 types belonging to 19 series. Descalabrado clay covers 43.3 per cent of the area, and Aguilita clay 11.9 per cent.

Capillary flow through an ideal uniform soil, W. O. SMITH (*Physics, 3 (1932), No. 3, pp. 139–146, figs. 6*).—An "ideal soil" is considered as an assemblage of spheres packed to a definite porosity. For statistical purposes, these may be represented by grains placed in hexagonal array, with adjacent grain centers equidistant and at a distance $(2r+d)$, where r is the grain radius and d a spacing constant adjusted to suit the observed porosity.

"Three sets of capillaries, found to extend continuously throughout the packing, furnish the channels through which fluid crosses the soil body. The velocity through the mean capillary is calculated by a method essentially due to Slichter; and from this quantity, the sectional area of the mean capillary, and the number of capillaries per square centimeter, the quantity of fluid per sec., f, crossing a soil of section area s and length L, is found to be

$$f=0.00809(1-P)^{2/3}\{0.9850/(1-P)^{2/3}-1\}^2\Delta pD^2s/\eta L$$

P is the porosity, D the diameter of the grains, η the viscosity of the fluid, and Δp the pressure difference under which the flow occurs. Intrinsic permeabilities computed from this equation are compared with values for carefully sized glass spheres and quartz sands observed experimentally by Green and Ampt. A further comparison with corresponding values calculated from Slichter's equation is given."

Lysimeter studies.—I, Moisture percolation through the soil profile, J. S. JOFFE (*Soil Sci., 34 (1932), No. 2, pp. 123–143, pl. 1, fig. 1*).—A critical analysis of the design and operation of the filled-in type of lysimeter having led to the conclusion that such an installation (as that of the Tennessee (E. S. R., 32, p. 719) and other stations) "does not represent natural soil conditions," and that the results obtained by its means "are of little value in interpreting the reactions that take place in the soil profile," the author put in use at the New Jersey Experiment Stations a type of lysimeter designed to overcome the drawbacks of the customary form, essentially by collecting the leachings from a known area of the under surface of each of the horizons to be studied in a profile of undisturbed natural structure and position.

Into the wall of a suitable lysimeter pit "under each horizon a tunnel, 50 cm long, is dug in the shape of the lysimeter which consists of a shallow funnel made of block tin 30.6 cm in diameter ($\frac{1}{55\frac{1}{000}}$ of an acre in area), 4 to 5 cm deep, with a sharp edge 3 to 4 mm high, and with 9 to 10 2-mm perforations in the neck. This funnel is filled with quartz pebbles, and its sharp edge rests against the roof of the tunnel. When the funnel is placed in the tunnel the distance from the wall of the pit to the funnel is 20 cm. The funnel is wedged upward and the open space between it and the wall of the pit is filled with the soil material dug out from the tunnel. After all the funnels are placed under the respective horizons—80 cm apart on a horizontal line . . . a board wall is built 8 to 10 cm away from the soil wall and the space is filled in with soil. Reinforcing and bracing the studdings to which the wall boards are nailed is an important precaution against their collapsing under the weight of the filled in soil." Further structural detail necessary to the completion of

the installation is given. From a 2-year study of the leachings collected by means of this set-up the following conclusions and observations, among others, are drawn.

The amount of effective precipitation ("that which produced leachings") was found to depend, in the case of the A_1 horizon, on the condition of the colloids in the soil. It showed no demonstrable correlation with the total precipitation. Through the A_2 horizon the percentage of the total rainfall collected as effective precipitation was higher during the first year, when the total rainfall was high, than during the second year, for which the total rainfall was lower. "Again the condition of the colloids seems to be responsible for the phenomenon observed." In the B horizon the moisture appeared to move horizontally.

"The data seem to indicate that on a level plat only a small fraction of the rainfall is lost to the ground waters. This might not be true in the coming years, for during the last two the departure from the normal precipitation amounted to 10 and more inches. It has been brought out that the effective precipitation might possibly be correlated with crop production."

Soluble aluminum studies—I, The concentration of aluminum in the displaced soil solution of naturally acid soils, W. H. Pierre, G. G. Pohlman, and T. C. McIlvaine (*Soil Sci., 34 (1932), No. 2, pp. 145–160, fig. 1*).—Examining with reference to their soluble aluminum content and the concentration of hydrogen and other ions and salts in their displaced soil solution 30 very acid soils "representing some principal soil types," the authors of this contribution from the West Virginia Experiment Station observed aluminum concentrations varying at pH 4.0 from 1.5 to 23 parts per million, at pH 4.5 from 0 to about 12 parts per million, and at pH 4.9 from 0 to about 2 parts per million. The concentration of soluble salts seemed to have an important effect upon the soluble aluminum content, the chloride, sulfate, and nitrate anions appearing equally effective in keeping up the aluminum concentration of the soil solution. A high organic matter content, on the other hand, appeared to result in an aluminum concentration much lower at a given H-ion concentration than that found in soils having a low organic matter content.

A marked seasonal variation in aluminum content was observed in certain soils under grass and in general crops, this fluctuation being considered to be associated with variations in the soluble salt content. The leaching of soils having a high soluble aluminum concentration reduced the soluble aluminum content markedly.

Characteristics of forest soils of the northwestern United States, W. L. Powers (*Soil Sci., 34 (1932), No. 1, pp. 1–10, figs. 2*).—In a contribution from the Oregon Experiment Station is reported a study of nine forest soil profile layers in which "maximum absorptiveness for moisture vapor or colloidality" usually appeared in the fermenting layers. The same material contained also the maximum numbers of microorganisms. The maximum base exchange capacity was generally found in nearly neutral fermenting or largely humified organic layers containing approximately 75 per cent of organic matter. A similar type of adsorption curve was obtained either with the barium or with the ammonium ion. Artificial mixtures of organic and inorganic soil colloids, varied by 20 per cent steps, showed a corresponding base adsorption curve.

The activity of earthworms in neutral or calcareous soil well supplied with decaying ligneous organic matter was found to favor the formation of a desirably intimate mixture of organic and inorganic soil colloids. Feeding roots were found massed in the forest soil just below this organic layer.

The distribution of potassium in deciduous orchard soils in California, O. Lilleland (*Soil Sci., 34 (1932), No. 1, pp. 11–18*).—In a contribution from the University of California, the author reports determinations of water-soluble and replaceable potassium at depths of 1, 2, 3, and 4 ft. in 21 alluvial (prune orchard) soils.

A definite reduction in the two potassium fractions with increased depth of sampling was found in practically all of the soils, and was most marked in the soils showing the higher percentages. A great variation existed in the water-soluble potassium in the surface foot of the various orchards, but the range of concentrations narrowed with increasing depth. The relationship between water-soluble and replaceable potassium did not seem to be "one of simple hydrolysis, as suggested by Magistad" (E. S. R., 60, p. 515). Samples identical in their replaceable potassium content but taken at varying depths exhibited varying water-soluble potassium contents. The surface samples showed a proportionally greater water-soluble fraction than did the deeper samples.

[Chemical composition of Fairbanks silt loam], G. W. Gasser (*Alaska Col. Sta. Bul. 1 (1931), pp. 9, 10*).—Analyses of the station soil and subsoil are reported.

Note on the occurrence of elementary carbon in soils, G. W. Robinson and W. McLean (*Jour. Agr. Sci. [England], 20 (1930), No. 3, pp. 345–347*).—Drawing attention to the possible presence in cultivated soils of coal and coke fragments, the authors describe experiments on the settling of 100-mesh samples of each of these possible contaminants. "Assuming that the carbonaceous residue in soil is partly coal and partly coke or cinder, we may take 75 per cent as a first approximation for the proportion left in the residue after decantation"; 66 per cent of the coal and 84 per cent of the coke having been found in the residue after experiments carried out at the settling velocity of 10 cm/250 seconds.

"The negligible figure for elementary carbon obtained in the case of uncultivated mountain soil shows that the decantation used has been successful in removing all, or nearly all, the true organic matter, and that the carbon actually found in the residue may be assumed to be elementary carbon. The uncertainty lies in the use of the factor for obtaining the elementary carbon from the residual carbon; but, unless the organic matter carbon is very low and the elementary carbon high, the error involved is of a lower order of magnitude than the content of organic carbon."

Of the results of determining and applying the correction for elementary carbon in the determination of organic carbon in 15 samples, it is noted that "in some cases the correction for elementary carbon amounts to a considerable proportion of the uncorrected carbon figure. The use of uncorrected figures for organic carbon in studies on soil organic matter can thus be the cause of considerable error, and where the presence of elementary carbon is suspected the correction should be determined and applied."

The carbon-nitrogen ratio of soil organic matter, W. McLean (*Jour. Agr. Sci. [England], 20 (1930), No. 3, pp. 348–354*).—The carbon-nitrogen ratio for 50 British soils from widely distributed areas averaged about 10:1, with a range of variation from 6.5 to 13.5 : 1. However, in 16 non-British samples the carbon-nitrogen ratios varied from 2 to 23:1. Soils from limited areas, whether high or low in organic carbon, gave approximately constant ratios, but these ratios varied from place to place. "It is suggested that the carbon-nitrogen ratios may be specific." The carbon-nitrogen ratios of arable soils did not differ appreciably from those of grassland, though the grassland per-

centages of carbon and nitrogen were somewhat the higher. There was no marked correlation between carbon-nitrogen ratios and fertility, but in all areas examined the percentages of carbon and nitrogen were higher in soils of high fertility than in poor soils in the same area.

"The writer suggests that the total organic carbon or the total nitrogen might be used as an index of fertility in the examination of crop-bearing soils in the same area. For routine work, the carbon determination is to be preferred both for rapidity and ease of manipulation."

Studies on the carbon and nitrogen cycles in the soil, I–III (*Jour. Agr. Sci.* [*England*], *20* (*1930*), *No. 3, pp. 455–488, fig. 1.*).—The work described in this group of papers, contributed from the Rothamsted Experimental Station, "is concerned chiefly with the humic matter and with the carbon and nitrogen economy of the soil."

I. *Introductory*, H. J. Page (pp. 455–459).—This consists principally of a collation and interpretation of the results of previous work reported by a number of investigators.

II. *The extraction of the organic matter of the soil with alkali*, C. W. B. Arnold and H. J. Page (pp. 460–477).—Report is made upon extractions of certain soils from the Barnfield and Broadbalk Fields at Rothamsted, the soils having received, respectively, organic manure, artificial fertilizers, and no manurial treatment; and upon a colorimetric examination of the extracts for the comparison of the content of humic matter. In spite of the different cultural and manurial treatments which the different plats have received, there was observed a marked similarity in the properties of the organic matter of these soils, with regard to its behavior on extraction with cold and hot dilute caustic soda, and with reference to the color intensity of the organic matter in the extracts.

III. *The formation of natural humic matter*, M. M. S. du Toit and H. J. Page (pp. 478–488).—Experiments in which were studied the decomposition of various plant materials and of purified preparations of plant constituents, during rotting under neutral aerobic conditions in the presence of soil organisms, are described. The formation of humic matter was found to be more closely related to the change in the lignin content than to the change in content of the other groups of plant constituents estimated.

Contribution to our knowledge of the chemical nature and origin of humus—I, On the synthesis of the "humus nucleus." II. The influence of "synthesized" humus compounds and of "natural humus" upon soil microbiological processes, S. A. Waksman and K. R. N. Iyer (*Soil Sci., 34* (*1932*), *No. 1, pp. 43–69, figs. 3; pp. 71–79, figs. 2*).—These two papers, contributed from the New Jersey Experiment Stations, present, on the basis of the extensive experimental data recorded, the following among other observations and conclusions:

Lignin was found to depress the rate of decomposition of proteins. "This depression is not due to any toxic action of the lignin, but is a result of the interaction of the lignin with the protein, which makes the latter more resistant to attack by microorganisms."

A resistant complex of lignin and protein was synthesized in the laboratory. This complex was similar in physical appearance and possessed the various chemical, physicochemical, and biological properties characteristic of the major portion of the soil organic matter, usually called humus or humic acid. It combined with such bases as calcium, magnesium, iron, and aluminum in a manner similar to that of the combination between soil humus and these bases. The synthesis of the lignoprotein complex, referred to as the humus-nucleus,

"enables one to carry out studies of the physical, chemical, and biological behavior of soil humus and its relation to the inorganic soil constituents, without having to use the complex humus of the soil itself," this humus varying considerably in chemical composition according to the soil from which it is obtained and the method of isolation.

"The formation of a humus-nucleus complex establishes definitely the relation between the organic nitrogenous substances and the nonnitrogenous substances of the soil humus; this is responsible for the resistance of the soil nitrogen to rapid decomposition by microorganisms. The formation of such a complex also suggests evidence to explain the more or less constant carbon-nitrogen ratio which exists in mineral soils. The synthesis of the humus-nucleus points to an explanation for the relation between the organic complexes in the soil and the inorganic soil constituents, especially the soil bases. At a pH less than 4.8, the lignoprotein complex is largely saturated with hydrogen, iron, and aluminum. The higher the pH value, the greater will be the replacement of the H-ion by calcium and magnesium ions and finally, at a pH of 9 or above, by sodium ions. At a reaction of pH less than 4.8, most of the complex exists as a hydrogen-lignoproteinate and also as iron and aluminum lignoproteinates; at a pH of 4.8 to 9, it exists largely as calcium and magnesium lignoproteinates, and probably also as iron and aluminum lignoproteinates; and at pH above 9, especially at 9.6 to 10, it exists largely as a sodium-lignoproteinate."

The synthesized humus complexes favored the decomposition of glucose by a mixed soil microbial population, especially in the absence of an added source of combined nitrogen. Like the natural soil humus, they could not supply the nitrogen needed by cellulose-decomposing microorganisms, but they benefited decidedly the decomposition of cellulose in the presence of available combined nitrogen. The ratio between the cellulose decomposed and the nitrogen consumed by the microorganisms decomposing the cellulose was not modified by the presence of humus complexes. Lignin did not depress cellulose decomposition; the effect was rather beneficial.

Lignin was found to lessen the rate of the decomposition of fungus mycelium, as measured by CO_2 liberation and NH_3 accumulation; a large part of the nitrogen of the mycelium could be isolated at the end of the experiment in the form of a lignoprotein complex. The influence of lignin upon the decomposition of casein was similar.

"Calcium-lignoproteinate has a favorable effect upon the decomposition of the fungus mycelium, as measured by both CO_2 evolution and ammonia accumulation. The hydrogen-lignoproteinate, however, had a slightly injurious effect, possibly due to its acid reaction. The synthesized humus complexes containing iron had a highly beneficial effect upon the fixation of nitrogen by Azotobacter."

Iron in relation to the stimulation of growth by humic acid, D. Burk, H. Lineweaver, and C. K. Horner (*Soil Sci., 33 (1932), No. 6, pp. 413–453, pl. 1, figs. 3*).—The stimulation of the growth of Azotobacter by humic acid was shown by the authors of this contribution from the U. S. D. A. Bureau of Chemistry and Soils to be a function primarily of the iron content of the organic material; other inorganic impurities and the organic fraction being substantially without effect. Natural humic acid could be replaced more or less satisfactorily (*a*) by complex, nonionized organic acid iron such as ferric citrate, tartrate, oxalate; (*b*) by inorganic iron such as ferric sulfate, metallic iron; and (*c*) by humic acids prepared synthetically from glucose and ferric sulfate, and containing considerable quantities of iron. Natural humic acid was not effectively replaced (*a*) by humic acids prepared synthetically from glucose

to contain no iron, or as little iron as possible; (*b*) by iron-free synthetic humic acids containing various metals such as Al, Co, Mn, Si, Mo, and P; or (*c*) by salts of such elements as Al, Co, Mn, Mo, Ni, Zn, Cr, Cu, and Ag at various metal concentrations ranging from 0.01 to 50 parts per million. The effect per unit of dry weight of a natural humic acid could be increased by increasing synthetically its iron content.

A statistical study indicated that in general, "a given suboptimal amount of soluble iron (about 0.2 to 1 part per million or less) gives the same order of magnitude of increased growth, independently of whether the iron is added as contained in natural humic acid or in any of its substitution compounds." It was shown, however, that the experiments must be continued long enough to avoid effects of induction period differences, and to permit of the complete consumption of the suboptimal quantities of physiologically active iron, and that "in experiments of relatively short duration it will often be found that inorganic iron, and even organic acid iron, will provide considerably less satisfactory stimulation than iron contained in natural or synthetic humic acids."

A postscript adds a brief report of experiments on tomato plants in water culture, conducted by E. S. Johnston at the Smithsonian Institution and supporting the conclusion of the authors that these results with Azotobacter are of general significance with respect to plant growth. A bibliography of 56 items is appended.

The physiological nature of humic acid stimulation of Azotobacter growth, D. Burk, H. Lineweaver, and C. K. Horner (*Soil Sci., 33 (1932), No. 6, pp. 455–487, figs. 8*).—This extension of the work noted above presents "various functional relationships obtaining when the growth of Azotobacter is stimulated by humic acid or iron compounds.

"Stimulation increase in growth velocity constant attains a maximum at about 50 parts per million humic acid, or about 0.5 p. p. m. iron, which is the same iron concentration as obtains with respect to the three other iron compound types; synthetic iron-containing humic acid, organic acid iron, and inorganic iron. As the active fraction of the stimulant is consumed during growth the initial concentration giving maximum growth may be increased to 5 to 15 p. p. m. iron, corresponding to about 500 to 1,500 p. p. m. natural humic acid.

"At constant temperature all factors observed to cause increased velocity constants of growth caused both relative and absolute decreased stimulation, with respect to nitrogen source, pressure of nitrogen gas, concentration of fixed nitrogen, medium constitution, age of culture, heaviness of culture, glucose concentration, and oxygen pressure. When the velocity constant of growth is increased as a function of suboptimal temperatures, the converse relationship obtains."

Humic acid was found not to act by increasing directly the availability of constituents normally added to, or present in, the medium (glucose, oxygen, free or fixed nitrogen, carbon dioxide, Ca, Mg, Na, K, Fe, PO_4, Cl, SO_4, HCO_3); nor by deactivating toxic metabolic products; nor by affecting the surface tension, viscosity, or potential difference between culture medium and organism.

The rôle of nitrogen in the production of spots in wheat fields, P. L. Gainey and M. C. Sewell (*Jour. Agr. Research [U. S.], 45 (1932), No. 3, pp. 129–148, figs. 2*).—The 1929 results of this investigation of the Kansas Experiment Station have been noted (E. S. R., 64, p. 32) from an earlier contribution. The present paper assembles the soil and crop analyses and the bacteriological work of 1929, 1930, and 1931.

The spots showed almost invariably a higher total nitrogen content of the soil, higher NO_3 content of the soil, higher percentage of nitrogen in the grow-

ing plant, higher total nitrogen absorption, higher yield of grain, and higher protein content in the grain. The increased total and available nitrogen in the soil of the spot did not appear to be associated with a more active nitrogen-fixing or nitrifying microflora.

"Spots identical in appearance and in quantitative measurements have been produced experimentally by the application of cow urine and certain other nitrogen-containing materials. All evidence thus far obtained points to the conclusion that the spots are the direct result of the presence of a more abundant supply of available nitrogen in the soil of these limited areas, particularly during the early spring growing period; and that this increased available nitrogen has arisen from a limited quantity of nitrogen, either already available or capable of being readily transformed into an available condition, finding its way into the soil, in most instances through the deposition of urine."

Nitrogen changes produced in certain nitrogenous compounds by Azotobacter and the nitrogen fixed in the presence of these compounds, L. G. Thompson, jr. (*Jour. Agr. Research [U. S.], 45 (1932), No. 3, pp. 149–161*).—The nitrogen changes produced by four species of Azotobacter in mannitol media containing 16 nitrogenous compounds were studied by the author of this contribution from the Iowa Experiment Station, the quantities of these compounds utilized by the organisms, together with their effect on nitrogen fixation, being determined.

The nitrates of sodium and potassium, potassium nitrite, urea, and the amide nitrogen of asparagin were shown to be attacked readily with the production of ammonia, which was then utilized by the organisms. These compounds inhibited nitrogen fixation almost entirely, and in some cases there was a loss of ammonia. With the exception of *A. vinelandii*, all the organisms tested utilized only a few of the amino acids, and where there was utilization its amount was very small. *A. vinelandii* utilized practically every amino acid tested, but the quantity used was not very large. In those cases in which amino acids were utilized, nitrogen fixation was usually depressed. If the amino acids were not utilized, nitrogen fixation was generally either stimulated or not affected. The simple nitrogenous compounds were found to be more readily utilized than the complex compounds.

With the exception of *A. vinelandii* the organisms that fixed the most nitrogen when grown in a nitrogen-free medium used the largest amount of nitrate nitrogen when grown in a medium containing nitrates. *A. vinelandii* fixed a large amount of nitrogen when grown on nitrogen-free medium but did not utilize quite all of the nitrates when grown in a medium rich in nitrate nitrogen. In the last-named medium it fixed a small amount of nitrogen. An Azotobacter strain designated No. 2 utilized 14 mg of nitrate nitrogen per 100 c c of medium in from seven to nine days.

Notes on the association of microorganisms and roots, C. Thom and H. Humfeld (*Soil Sci., 34 (1932), No. 1, pp. 29–36*).—In agreement with Starkey (E. S. R., 66, p. 317), the authors find at the U. S. D. A. Bureau of Chemistry and Soils (*a*) that there are increased numbers of microorganisms in samples of soil taken in proximity to plant roots, and (*b*) that these numbers are many times greater when the roots themselves are examined.

The data presented led to the conclusion that corn roots penetrating through masses of soil of either strongly acid or strongly alkaline reaction still maintain their own reaction in or near the range pH 6 to pH 7.5, within which bacteriological activities are much more vigorous than under more acid or more alkaline conditions, creating about them a very narrow zone favorable to bacterial and mold activity.

From soil samples showing acidities expressed as pH 4.8 to pH 8.1 and ranging in texture from that of clay loam to that of sandy loam, the samples of fibrous roots with adherent soil particles gave reactions less acid than the acid soil and less alkaline than the alkaline soils, the figures ranging from pH 5.6 in one sample of roots from Collington loam at pH 4.8 to roots at pH 7.6 on Carrington loam at pH 7 on the one side; and on the other, roots at pH 7.5 on an "alkali" soil from Colorado testing pH 8.1. Mold cultures from corn roots in acid soil produced predominantly Trichoderma colonies; corn roots from alkaline soil seemed to be associated predominantly with Penicillia of the biverticillate series (*Penicillium luteum* and its allies). High colony counts of fungi occurred on the very acid soils and the very alkaline samples.

Decomposition of keratin by soil microorganisms, H. L. Jensen (*Jour. Agr. Sci.* [*England*], *20* (*1930*), *No. 3, pp. 390–398, fig. 1*).—Report is made in a contribution from the Rothamsted Experimental Station upon experiments in which keratin, prepared from horn meal and added to moist field and garden soil, was found to undergo a decomposition resulting in a slow but steady accumulation of ammonia and nitrate; 35 to 40 per cent of its nitrogen was transformed into nitrate after 120 days. The addition of keratin produced little or no increase in the number of bacterial colonies on agar platings, but markedly increased the number of actinomycete colonies, especially in garden soil.

Two strains of actinomycetes were isolated and found capable of thriving on keratin in pure culture, decomposing the keratin with the formation of ammonia. One of the strains could be recognized as *Actinomyces citreus* Krainsky, as described by Waksman (E. S. R., 42, p. 434). The other strain could not be named, but corresponded closely to the description of Waksman's Actinomyces 145.

The soil as a habitat for growth of green algae, C. E. Skinner (*Soil Sci., 34* (*1932*), *No. 1, pp. 25–28*).—The author reports in a contribution from the University of Minnesota the results of experiments showing that algae inoculated in soil partially sterilized by heat are able to increase as much as 500-fold when incubated at room temperature in total darkness for long periods of time. These experiments "offer added evidence that soil is a habitat for certain green algae, and that the algae multiply in soil under conditions of darkness and of moderate moisture." Work on the isolation of soil algae is noted below.

Isolation in pure culture of green algae from soil by a simple technique, C. E. Skinner (*Plant Physiol., 7* (*1932*), *No. 3, pp. 533–537*).—This contribution presents a detailed account of a technic whereby the author was enabled to isolate from soil samples, with the expenditure of very little actual manipulative effort, about 50 soil strains of unicellular and small filamentous green algae. With the use of the method here given, "the isolation of algae from soil offers fewer difficulties than the isolation of anaerobic bacteria by the usual somewhat similar technic."

Essentially, an inorganic medium is solidified by adding 1.5 per cent of agar agar and sterilized at 15 lbs. steam pressure (but as briefly as possible in order to avoid hydrolysis of the agar); of the agar medium 12 tubes are liquefied, cooled to from 42 to 45° C., and inoculated by adding to one tube a few drops of an approximately 10 per cent suspension of the soil in sterilized tap water; the remaining tubes being inoculated by successive dilution, each receiving from 1 to 2 c c of the dilution immediately preceding. After incubation in bright daylight or with a few hours of sunlight each day until green colonies appear, the colonies are picked out and inoculated into tubes of a liquid inorganic medium, preferably a rather acid solution of which the formula is given.

"As soon as a green color has developed in the tubes of liquid media, shake agar dilution cultures are again made and incubated. When these show growth, tubes showing a few isolated colonies are selected and the colonies again picked." This time, however, the transplants are put into another inorganic medium to which is added 0.5 per cent of glucose and 0.2 per cent of peptone. The further details of the isolation procedure are fully treated.

"Solutions near a neutral reaction are used in agarized media so as to prevent hydrolysis of the agar. . . . The acid liquid media are used to depress bacterial growth. . . . It must be remembered, however, (1) that while acid liquid media tend to repress bacterial growth, excess acid hydrolyzes agar and thus enhances mold development; (2) that nitrates are often inferior to ammonium salts for algae and also fail to supply available nitrogen for certain molds and bacteria; and (3) that media containing ammonium salts tend to become acid and those containing nitrates tend to become basic, owing to selective absorption of the nitrogen-carrying ions."

A comparison of the soil-plaque method with the Neubauer and Hoffer cornstalk methods for determining mineral soil deficiencies, L. C. Stewart, W. G. Sackett, D. W. Robertson, and A. Kezer (*Colorado Sta. Bul. 390 (1932), pp. 59, figs. 8*).—The results of this investigation indicated that the soil-plaque (E. S. R., 66, p. 616) method, used on 108 soils, and the Neubauer (E. S. R., 53, p. 319) method, used on 66 soils, are equally reliable for the determination of mineral soil deficiencies. The Hoffer cornstalk (E. S. R., 56, p. 220) method, used on 54 fields, was also satisfactory in the majority of cases for the determination of the potash and nitrogen needs of corn when marked deficiencies or abundant supplies existed, but for border-line cases it proved less dependable. Close correlations between the results of the different methods were obtained where comparisons were possible.

"The soil-plaque method is well adapted to the determinations of phosphate deficiencies and may prove equally valuable in relation to potash. Taking into consideration reliability, ease of manipulation, time required, expense involved, and general application to the determination of mineral soil deficiencies for all crops, the soil plaque is the most desirable of the three methods investigated."

The applicability of the Azotobacter (plaque) method for determining the fertility requirements of Arizona soils, R. A. Greene (*Soil Sci., 34 (1932), No. 2, pp. 83–93*).—Report is made from the Arizona Experiment Station of a trial of the Winogradsky, or Azotobacter soil plaque method, successfully used by Sackett and Stewart (E. S. R., 66, p. 616) for the determination of nutrient deficiencies in Colorado soils. Of Arizona soils, 14 out of the 33 examined failed to develop Azotobacter colonies on the plaques "under any conditions"; 19 of the soils did develop colonies; but "the mineral deficiencies of the soil as determined by the Azotobacter method definitely agreed with field observations only in the case of four soils (12 per cent)."

The author expresses the opinion that the minimum potassium requirements of Azotobacter are "so small that this test is not a good index of potassium needs of a soil"; and that, although the phosphorus requirement of Azotobacter appears higher than that for potassium, "this test is of value only in the case of soils extremely deficient in phosphorus." It is further stated that "this test is of little value in determining the potassium and phosphorus requirements of the soils of Arizona, which are characterized by relatively high pH, their calcareous nature, and an active Azotobacter flora which has become adapted to these conditions."

Soil management on the Carrington silt loam, P. E. Brown, H. R. Meldrum, A. J. Englehorn, and R. E. Bennett (*Iowa Sta. Bul. 291 (1932), pp. 81–100, figs. 3*).—Using 5 cooperative experimental fields, the addition of organic matter and nitrogen to the soil through leguminous residues was of particular value on this type. Farm manure brought about considerable increases in the yields of all crops. The profits from the use of lime on this soil were found to be large.

Rock phosphate and superphosphate were both found very effective, in some cases rock phosphate gave slightly the larger effects while in others superphosphate proved more beneficial. "Under the livestock system of farming, rock phosphate has given slightly larger increases in the corn and small grain crops than superphosphate. Superphosphate has shown up to better advantage on the hay crops. Under the grain system of farming where the residues are employed, superphosphate has shown up to better advantage than rock phosphate. The differences, however, are not very great." In some cases complete commercial fertilizers were used to advantage, but in general a phosphate fertilizer appeared quite as desirable.

Kind of fertilizers North Carolina farmers used in 1931, C. B. Williams (*North Carolina Sta. Agron. Inform. Circ. 71 (1932), pp. [1]+8*).—The tonnage of commercial fertilizers of various analyses bought by the State's farmers during 1931 is tabulated.

AGRICULTURAL BOTANY

Modern methods of plant systematics [trans. title], M. A. Rozanova (Rosanova) (*Trudy Prikl. Bot., Genet. i Selek. (Bul. Appl. Bot., Genet. and Plant Breeding), 1930, Sup. 41, pp. 184, figs. 31*).—The eight chapters of this monograph cover morphological, biochemical, genetic, and cytologic methods, with supplements to the methods of systematic investigation in the field of cultivated plants. A list is appended of 123 references in Russian and 316 in other languages.

Floral development in cereal plants [trans. title], Y. Noguchi (*Jour. Col. Agr., Imp. Univ. Tokyo, 10 (1929), No. 4, pp. 247–303, figs. 46*).—The result is presented of study applied to 10 cereals, with discussion.

Tests of Chibnall's method of extraction for investigating winter hardiness of plants, W. E. Tottingham, R. G. Shands, and E. D. Delwiche (*Plant Physiol., 6 (1931), No. 1, pp. 167–176, figs. 10*).—Analytic examination of the protoplasmic extract of Chibnall's method (E. S. R., 51, p. 309) of recovery from selected tissues of wheat and alfalfa shows changes in composition which may be related to the development of cold hardiness. This method of tissue fractionation is considered to merit further tests as to its usefulness.

Use of expressed sap in physiologic studies of corn, J. D. Sayre and V. H. Morris (*Plant Physiol., 6 (1931), No. 1, pp. 139–148, figs. 4*).—The sap expressed from a corn tissue sample was influenced by its size, the kind of tissue, its moisture content as conditioned by its developmental stage, and its preliminary treatment.

The content of total contained solids differed in successive portions of the sap according to the above factors. Sucrose and free reducing total sugars remained constant in successive portions of sap expressed after grinding the tissue, but decreased in successive portions from minced tissue. From both the sap obtained by the standard methods of expressing and from that expressed after grinding, the coefficient of correlation was 0.9913. Sap samples that were

satisfactory for certain physical or chemical examinations were provided by expressing a 100-g sample of ground fresh corn with a pressure of 5,000 lbs. per square inch, forcing the sap through a filter, and allowing five minutes for draining.

Physiological studies in the pineapple roots [trans. title], S. WATANABE (*Jour. Soc. Trop. Agr.* (*Nettai Nôgaku Kwaishi*), *3 (1931), No. 3, pp. 203–217, figs. 3*).—A study of *Ananas sativus*.

Phenolase activity in relation to seed viability, W. C. DAVIS (*Plant Physiol., 6 (1931), No. 1, pp. 127–138, figs. 3*).—This report describes the use of a modification of the Nadi reaction in a study of seed vitality aiming at phenolase determination.

Phenolase activity was high in young seeds showing high germination and low in old seeds giving low germination. Enzymatic material heated at 25° C. for 90 minutes did not show an increase in phenolase activity. Phenolase and catalase activity were in general parallel in cucumber and in wheat.

Enzymatic activity of vegetative organism and some phenomena of physiological immunity [trans. title], K. SUKHORUKOV (*Zhur. Opytn. Agron. Iugo-Vostoka* (*Jour. Agr. Sci. S.-E. of U. S. S. R.*), *8 (1930), No. 2, pp. 237–266, figs. 6; Eng. abs., p. 266*).—This work was designed to bring out any correlation existing between differences of internal enzymatic states and degrees of resistance to parasitism. It was found that correspondence existed between peroxidase content and resistance to parasitism in case of Orobanche on plants tested, and in case of sunflower rust; the immune forms and parts showing the higher peroxidase activity.

The physiology of the cotton plant.—I, Investigation of the processes of assimilation, the dynamics of the stomatal apparatus, and the transpiration of the cotton plant [trans. title], V. A. NOVIKOV (*Zhur. Opytn. Agron. Iugo-Vostoka* (*Jour. Agr. Sci. S.-E. of U. S. S. R.*), *8 (1930), No. 2, pp. 267–304, figs. 8; Eng. abs., pp. 303, 304*).—The assimilation process in the cotton plant reaches its maximum in the time of brightest sunshine, generally ranging low on dark days, though a degree of exception to this is to be found in certain sorts. Early varieties assimilate 50 per cent more energetically than do the late varieties. Low temperatures may here constitute a factor stimulating to growth. Plants growing in dry soil show much lower assimilation than do plants in soils having normal moisture. Outflow of assimilated material from the leaves differs characteristically with variety, at different hours, and for the day as a whole. In clear sunshine the stomata open, maximally about 12 m. to 1 p. m. Toward 3 p. m. the aperture begins to decrease progressively, closing about 8 p. m. The aperture averages less in cloudy weather. The maximum of assimilation coincides with the maximum of stomatal aperture. Transpiration decreases toward noon in correspondence with the high accumulation of dry matter in the leaf, but the decrease does not correspond to stomatal aperture decrease. Decrease of transpiration in the hours in which the water content remains constant and the stomata remain wide open is thought to be connected in some way with the accumulation of assimilated material in the leaf. The capacity of regulating stomatal aperture is considered to be connected with drought resistance. Cotton plants under ordinary field conditions transpire daily about 28.054 tons per hectare.

Respiration studies of strawberries, E. L. OVERHOLSER, M. B. HARDY, and H. D. LOCKLIN (*Plant Physiol., 6 (1931), No. 3, pp. 549–557*).—Tests of strawberries did not show direct correlation of greater firmness of flesh with low respiration intensity in case of either immature or mature fruits.

Movement of water in plants as affected by a mutual relation between the hydrostatic and pneumatic systems, E. M. Harvey (*Plant Physiol., 6 (1931), No. 3, pp. 495–506, figs. 5*).—The present paper gives an account and suggests an explanation of the phenomenon upon which certain contributions by authors mentioned are said to have borne more or less directly regarding water movements in plants indicating a force acting definitely and in some strength both toward and away from the source of suction. A model described as simply and easily put together was constructed and is claimed to illustrate the possible mechanism by which a hydrostatic and a pneumatic unit in the plant interact. "The interaction of this multiple system might be [somewhat fairly] compared to what goes on in the several hydrostatic-pneumatic units of a stem."

External polarity potentials in the apex of the Douglas fir before and after mechanical stimulation, E. J. Lund (*Plant Physiol., 6 (1931), No. 3, pp. 507–517, figs. 4*).—"In the normal unstimulated condition of the Douglas fir, *Tsuga pseudotsuga*, the main apex of a lateral branch maintains an electropositive condition to all points on the branch below it. The main apex is also electropositive in the external circuit, to each one of the apexes of the first pair of lateral shoots. The electropositive condition of the main apex corresponds to its dominance in growth." Alterations and other conditions are discussed.

"The preliminary simple experiments in the present paper suggest that the physicochemical mechanism of maintained electric polarity is the same as, or at least is a mechanism which is linked with, the mechanism of irritability of the living cells. The same conclusion also follows from previous work in this laboratory on the electric polarity in roots."

Plant anatomy as conditioned by light intensity and soil moisture, W. T. Penfound (*Amer. Jour. Bot., 18 (1931), No. 7, pp. 558–572, figs. 8*).—As the result of an attempt to determine the changing effects of varied light intensity and soil moisture on the structure of roots, stems, and leaves of selected plant species, it is stated that plants grown in full sunlight differed from those grown in shade in several ways, which are detailed.

Some properties of plant waxes in relation to climate of habitat, J. B. McNair (*Amer. Jour. Bot., 18 (1931), No. 7, pp. 518–525*).—Data of some 232 waxes are reclassified to develop new relationships.

Biochemical studies on rice starch, I, II, W. S. Tao (*Bul. Chem. Soc. Japan, 5 (1930), No. 2, pp. 64–73*).—Two experiments are reported.

I. *The chemical changes of the starch during the germination of rice in darkness* (pp. 64–69).—It appears from the tabular showing that the loss of weight during germination of rice seeds at 20° C. is due, as has been shown by other observers to occur in germination of other seeds, to the transformation of starch into other substances, the total of fat remaining unchanged. There were lost 0.95 g of starch per 100 rice grains, while 0.26 g of reducing sugars plus soluble polysaccharides (calculated as *d*-glucose) were formed during germination. The difference is supposed to be converted into carbon dioxide and water for the germination. "Thus, the fate of the starch in the seeds during germination would be considered in the following manner; one part of starch was transformed by hydrolysis into soluble polysaccharides and simple sugars of unknown nature, and one part of the sugars was then decomposed by oxidation into carbon dioxide and water, similar to the function of respiration. . . . The energy liberated in these transformations of starch was evidently utilized for the germination of the seeds. The main source of the energy would be supplied by the complete combustion of the simple sugar

molecule. . . . Thus, the energy which was required for the germination of one grain was estimated approximately from the quantity of diminished starch, based on the assumption stated above, to be 3,000 calories."

II. *Temperature effects on the germination of rice seeds in darkness* (pp. 69–73).—Though in the experimentation referred to above, the chemical changes involving rice starch during germination at 20° were studied, in practice the most favorable temperature for the purpose of obtaining strong and healthy seedlings is said to be 35°. The author has further studied, and here follows, in tabular and brief discussional detail, the germination of rice seeds at 20, 35, and 40° in order to consider the temperature effects of the chemical transformation of starch during the process.

The weight loss was greater in the seedlings than in the seeds, and greater at 35° than at 20 or 40°.

Food reserves in relation to other factors limiting the growth of grasses, L. F. Graber (*Plant Physiol., 6 (1931), No. 1, pp. 43–71, figs. 4*).—Marked quantitative responses of root, rhizome, and top growth in such plants as bluegrass, redtop, fescue, and timothy, grown under field and greenhouse conditions, are correlated with cutting treatments which affect the internal environment. Reduction in growth so produced sometimes persists for months. When photosynthesis is interrupted by frequent removals of top growth the corresponding limitations of subterranean development may involve greater susceptibility to drought, lessened absorptive capacity, and increased winter and insect injury. The first important factor of growth limitation may be nitrogen deficiency due to frequent and close removals of the succulent top growth of grasses. With rapid stimulation of regeneration the carbohydrate reserves are rapidly consumed. Delay in recovery may, under conditions, interfere with uniformity of growth and encourage the growth of certain weeds. Organic food reserves have a significant ecological relationship, especially in grasslands.

The process of accumulation of nutritive substances by sunflower in the field [trans. title], M. Ivanov (*Zhur. Opytn. Agron. Iugo-Vostoka (Jour. Agr. Sci. S.-E. of U. S. S. R.), 8 (1930), No. 1, pp. 161–213; Eng abs., pp. 212, 213*).—Results are presented of a study in 1927 and 1928 involving the accumulation of dry weight, ash, nitrogen, and crude oil during the growth of the sunflower variety No. 169 from the selection department of the Saratov Experiment Station.

It is claimed that the moisture percentage in the sunflower as a whole decreases from sprouting to maturity, the flower bud retaining throughout the growth period the highest percentage of all the parts. This percentage increases as that in the leaves and stems decreases. Hygroscopic moisture in the seeds decreases as oil increases. Dry weight in the plant increases slowly during the early growth stages, more rapidly afterwards, attaining a maximum soon after blooming, and toward harvest time showing a slight decrease, so that the peak of dry weight is attained from 25 to 30 days before harvest. Development in the flower bud and seeds goes on coincidentally with transfer of organic material from leaves and stems, being notable during the period of blooming and ripening. During maturity, a considerable decrease in dry weight percentage occurs, due to loss of leaves and also to increased respiration. The nitrogen percentage in the plant as a whole, specifically leaves, stem, and flower bud, decreases in the ripening period, while that in the seeds increases. A difference in dates is noted for the occurrence of the nitrogen maximum in leaves, stems, and flower bud separately, this principally just before or after blooming.

Toward harvest, a loss of nitrogen occurs throughout the plant. In the beginning period of growth, less organic matter per unit of nitrogen is formed than during the period of filling out. Ash percentage is highest in the leaves, second highest in the flower bud, and least in the stems, being very low in the seeds compared with the vegetative parts of the plant. Ash in the whole plant, as in the seeds, decreases toward harvest, while that in the leaves increases, reaching the maximum from 15 to 25 days before harvest. In ripening, the ash decreases from causes not ascertained. For the plant as a whole, and for stem, flower bud, and seeds, the "ash correlation" increases toward ripening, though for the leaves it remains constant. No accumulation of oil occurs during blooming, when the embryo is forming. The maximum of oil accumulation in the seeds is reached about the middle of the ripening period, some portion being lost toward harvest time.

The diurnal and seasonal changes in the sugar content of the sap and tissue of potato plants as affected by soil fertilization, R. C. Cole (*Soil Sci., 33 (1932), No. 5, pp. 347–362, figs. 3; abs. in Michigan Sta. Quart. Bul., 15 (1932), No. 1, pp. 45, 46*).—A report is given of a study undertaken to determine the diurnal and seasonal variations in the sugar content of the leaves and stalks of potato plants as influenced by fertilization and to ascertain whether variations in yields of the crop due to fertilization could be correlated with the sugar content of the plants. Samples were taken every four hours, beginning at midnight of one day and continuing until midnight of the following day, during three different stages of growth of the plants.

In practically all samples, the glucose was found to be in excess of the sucrose. The sucrose content remained practically constant throughout the day, while the glucose content followed a more or less definite cycle, beginning at a minimum usually at 4 or 8 a. m. and reaching a maximum at noon or 4 p. m. As the plants grew older, the total sugar content increased. No differences in sugar content of the plants were found which could be correlated with fertilizer treatments.

Seasonal changes in total, soluble, soluble-protein, non-protein, and insoluble nitrogen in current year's shoots of Bartlett pear, A. S. Mulay (*Plant Physiol., 6 (1931), No. 3, pp. 519–529, figs. 2*).—As resulting from work undertaken to determine at the university farm, Davis, Calif., the seasonal variations in the nitrogenous compounds in bark and in wood of current year's growth of Bartlett pears aged 6 years and considered typical, well-managed trees for the locality, tabulations are given with discussion.

New growth starts with high total nitrogen in the bark which decreases with growth. After the checking of growth, total nitrogen increases, reaching a maximum in winter, falling again with opening of new buds, and drawing on the reserves in the shoots. Insoluble nitrogen is mainly affected by these seasonal changes.

Total nitrogen changes in the wood somewhat parallel those in the bark, though in that case changes in soluble nitrogen mainly cause the seasonal fluctuations in wood.

Soluble proteins, which form only a small fraction of the total nitrogen, both in bark and in wood, increase in late summer and autumn and decrease in later winter and spring.

Utilization of certain nitrogen compounds by the sugar cane, J. H. Pardo (*Internatl. Sugar Jour., 32 (1930), No. 373, pp. 11–18*).—According to this abstract of a thesis submitted by the author to the faculty of Louisiana State University, sugarcane is able to obtain its nitrogen from compounds other than

nitrates, utilizing directly ammonium compounds as nitrogen sources. Sugarcane assimilates more nitrogen from ammonium compounds than from nitrates of equivalent nitrogen content by weight. Ammonium absorption leads potentially to a great saving of energy. Hindering and favoring factors are detailed.

Absorption of mineral elements by plants in relation to soil problems, D. R. HOAGLAND (*Plant Physiol., 6 (1931), No. 3, pp. 373–388*).—This discussion considers both soils and plants, with particular reference to work during the previous 15 years.

Studies in the biology of metals, III–VI (*Protoplasma, 5 (1928), No. 1, pp. 135–141, fig. 1; 5 (1929), No. 4, pp. 535–562, fig. 1*).—These sections follow up those contributed earlier by Hammett (E. S. R., 64, p. 212).

III. *The localization of lead within the cell of the growing root,* F. S. Hammett (pp. 135–141).—A variety of tests on root tips of *Allium cepa, Zea mais,* and *Vicia faba* is claimed to prove definitely that lead combines in especially high concentration with the nuclei and cell walls of these structures.

IV. *The influence of lead on mitosis and cell size in the growing root,* F. S. Hammett (pp. 535–542).—It is said to have been shown decisively that, in the growing root, lead retards cell proliferation though allowing cell growth in size to proceed unrestricted.

V. *The selective fixation of lead by root nuclei in mitosis,* F. S. Hammett and E. S. Justice (pp. 543–546).—It is said that the mitotic nucleus of the growing root has a special avidity for lead, and that it is largely because of this that growth by cell proliferation is inhibited by the metallic ion.

VI. *The nature of the lead compound deposited in the growing root,* F. S. Hammett (pp. 547–562).—In an analysis of the lead-containing deposit found concentrated in the region of cell proliferation of roots of seedlings grown in culture solutions containing lead, made by microchemical methods, the tests indicated that the precipitate is a combination between lead and an organic sulphydryl compound analogous to if not identical with glutathione. The implications are discussed.

Proof of the essential nature of copper for higher green plants, C. B. LIPMAN and G. MACKINNEY (*Plant Physiol., 6 (1931), No. 3, pp. 593–599, figs. 2*).—In connection with experimentation reported previously by Sommer and Lipman (E. S. R., 61, p. 23), one experiment was conducted to determine whether or not copper is essential to the higher green plants. Flax was used, and a series of cultures was run in solutions containing no copper with a parallel series the same in all respects except that 0.125 part per million of copper was added in the form of copper sulfate. The plants in the separate series grew equally well until blossoming, when those in the series having no copper bloomed less than the others, but no plant deprived of copper produced any seed or capsule. This result was confirmed. As a result of these studies barley plants are shown to be unable to seed without the presence of a small quantity of copper in the root medium. It is suggested that copper may be essential to every phase of plant growth. This is said to confirm some work carried out several years previously. From one-sixteenth to one-eighth of a part per million of copper in the root medium is sufficient to give the results indicated.

Effect of manganese, copper, and zinc on the growth of yeast, J. S. MCHARGUE and R. K. CALFEE (*Plant Physiol., 6 (1931), No. 3, pp. 559–566, figs. 3*).—Though the sulfates of manganese, copper, and zinc, in small quantities, increased the dry weight of yeast produced, excessive quantities of salts of these elements resulted in decreased growth or in death of the cells. Parti-

culars are given. Control cultures containing dextrose gave but slightly more carbon dioxide than did the sucrose controls.

Relation of H-ion concentration of tissue fluids to the distribution of iron in plants, R. A. Ingalls and J. W. Shive (*Plant Physiol., 6 (1931)*, No. *1, pp. 103–125, figs. 10*).—The H-ion concentration of plant tissue fluids corresponds to light intensity. Fleshy or succulent plants vary more as regards pH in response to light intensity than do thin leaved plants, and the degree of variation tends to be in proportion to the succulency.

All plants show differences in H-ion concentration between leaf juices and stem juices, though fleshy or succulent plants show much lower differences.

Soluble (filtrable) iron content of plants varies directly with the pH concentration variation produced by day to night changes in light intensity. Plant tissue fluids having low pH show high total and relatively low soluble iron content, those having high pH show low total iron but fairly high soluble content. In all plants studied, the iron content of the leaves was higher than that of the stems.

Influence of acetic, propionic, normal butyric, and sulphuric acids and potassium acetate on elongation of primary roots of seedlings of white lupine, M. Coggeshall (*Plant Physiol., 6 (1931), No. 3, pp. 389–445, figs. 12*).—This report gives the main results of a study carried on in the laboratory of plant physiology at Johns Hopkins University in 1929–30 on the influence of these reagents upon the elongation of primary roots of young seedlings of white lupine (*Lupinus albus*), the main series of numerical data (tables and graphs) being those of the primary root elongation occurring in the treatment and in the recovery period.

Some effects of acetylene on the ripening processes of bananas, R. Hartshorn (*Plant Physiol., 6 (1931), No. 3, pp. 467–484, figs. 8*).—The experimentation here reported as carried out in 1928 to ascertain whether acetylene is capable, as are both ethylene and propylene, of hastening the ripening processes of fruits, is said to show that the so-called carbide treatment hastens the ripening process in thoroughly green bananas as shown by the rates of changes in softening, respiration, starch hydrolysis, flavor, and color. There appeared to be no sharp limits to concentrations of acetylene giving these results.

Though the difference in the respiratory rate may be considerably increased at a given time by the treatment, the maximum respiratory rate during ripening may not be greatly altered by the treatment except in severely chilled fruit. The effect shows mainly in the shortening of the period of low activity at the beginning of the ripening process. The condition of the fruit at the start is of prime importance. The results from the acetylene agree with those from ethylene, also from its previously determined effects on horticultural material.

Plant material introduced by the Division of Foreign Plant Introduction, Bureau of Plant Industry, October 1 to December 31, 1930 (*U. S. Dept. Agr., Inventory 105 (1932), pp. 79*).—Descriptive notes are given of 1,626 lots of seeds and plants introduced for testing in different parts of the United States.

GENETICS

Introduction to the general cytology of the Cruciferae, I. Manton (*Ann. Bot. [London], 46 (1932), No. 183, pp. 509–556, figs. 124*).—Studies of the chromosomes in the root tip cells of some 250 species of crucifers suggested that the distribution of chromosomes in this family is explicable only on the basis that

there have been two independent types of evolutionary activity—namely, a multiplication of forms and progressive evolution. The chromosomes were generally small, those of Matthiola, Hesperis, Iberis, Bunias, and Menonvillea being exceptions. Aneuploid loss was evident and was demonstrated very clearly in Matthiola. Polyploidy between species was frequent, the highest values being observed in Crambe.

Genetic and cytological studies in wheat, V, A. E. WATKINS and F. M. CORY (*Jour. Genetics, 25 (1931), No. 1, pp. 55–90*).—Continued genetic investigations (E. S. R., 58, p. 423) of the partially sterile pentaploid wheat hybrids which form 14 bivalents and 7 univalents at meiosis are described. The factors *R* and *r* for rough and smooth chaff, *Re* and *re* for red and white chaff, *W* and *w* for waxy and waxless foliage, *B* and *b* for awnless and awned spikes, and the linked groups *K* and *k* for keeled and rounded glume and other characters, were all carried by chromosomes paired in F_1. *Re* and *W* could not be tested together, but otherwise the 5 pairs are independent except for *K* and *B*, which have a crossover value of 40 per cent. All the factors segregated regularly in F_1, giving 1:1 ratios, but none appreciably affected grain germination or pollen sterility. It appeared unlikely that the paired chromosomes in general had a direct effect on these forms of sterility in *Triticum vulgare* × *T. turgidum*. Allosyndesis was the rule and autosyndesis the exception in the hybrids studied. It was evident that no less than 11 or possibly 12 of the paired chromosomes are closely similar in the 2 species. The inheritance of waxy and waxless foliage is reported on in considerable detail.

Wheat-barley matings, G. S. GORDON and A. R. RAW (*Jour. Dept. Agr. Victoria, 30 (1932), No. 3, pp. 138–144, figs. 6*).—The genetic behavior of the progenies from several wheat-barley matings was studied at Werribee State Research Farm. Progenies of wheat pollinated by barley showed complex segregation and produced dwarf and awned types in various ratios, but had no barley characters. Similarly, barley pollinated by wheat gave rise to no wheat characters. Cytological studies on F_2 of Brevet wheat × White Hull-less barley showed striking irregularities in certain of the meiotic divisions, and the presence of a number of univalents was observed. The progeny, however, had the normal complement of 42 (2 n) chromosomes. The behavior of the progeny of these wheat-barley matings seemed to furnish evidence that chromosomal aberration in some form or other had occurred within the cells of the ovule parent.

A cytological and a genetical study of Petunia.—IV, Pollen grains and the method of studying them, M. C. FERGUSON and E. B. COOLIDGE (*Amer. Jour. Bot., 19 (1932), No. 7, pp. 644–658, pl. 1, figs. 2*).—At Wellesley College 14 somatic chromosomes were found in *P. violacea* and *P. alba*, respectively, and 18 in *P. parviflora*. Pollen grains assumed a spherical form when placed in aqueous solutions, but were not changed appreciably in form or size when mounted in a thin solution of Canada balsam in xylol. The authors conclude, therefore, that descriptions of pollen grains as observed in aqueous media are of doubtful value. The marked differences observed in the appearance of pollen grains of species and of polyploids frequently disappeared in water solutions. The pollen grains of Petunia are naturally ellipsoidal.

Contributions to a genetic analysis of the horse (broad or Windsor) bean, Vicia faba [trans. title], M. J. SIRKS (*Genetica [The Hague], 13 (1931), No. 3–6, pp. 209–631, figs. 43; abs. in Imp. Bur. Plant Genet. [Cambridge], Plant Breeding Abs., 2 (1932), No. 4, pp. 218–220*).—Studies on the inheritance of characters in the horse bean were continued for longer than 15 years and involved 25 pure lines in the major (large seed) group and 8 of the minor

(small seed) group. There were 79 major × major crosses, 27 major × minor, 11 minor × major, and 7 minor × minor crosses. The successive sections consider characters of growth, leaves, inflorescence and flowers, fruits and seed, semisterility and zygotic sterility, and linkage. The bibliography includes 58 titles.

Erect habit of growth, *E*, behaved as a simple dominant to prostrate, *ee* being nonviable when minor plants served as female parents. For internode number a series of 3 allelomorphs, I_1 to I_3, was established. Stem length depended also on a second series of allelomorphs, G_1 to G_4 independent of the first series. These 2 sets of factors were not evident in the prostrate type. The *G* series was more active in the minor group than in the major, so that reciprocal crosses between these groups were not identical. Stem length and number of stems per plant were correlated negatively and depended on the same factors.

Number of leaflets was also governed by the I_1–I_3 series. Leaf dimensions depended on a series of triple allelomorphs identical with G_1–G_4, with another group T_1–T_2 intensifying the length of the terminal portion of the leaf, and similar factors *W* and *B* intensifying the width and length of the basal portion, respectively. In this case the behavior of the *G* factors in the major and minor lines did not differ; with minor as a female parent, however, *BB*, T_1T_1, and T_2T_2 were lethal.

The presence of both *A* and C_3 factors determined for leaf color gives normal, absence of *A* subtypica, and the absence of both albina. Allelomorphic with C_3 are C_1, chlorina, and C_2, semichlorina. Another factor *V* acts on C_3 and C_2, producing variegation, and on segregation of this factor in variegata plasm, the *v* gametes, while in subtypica plasm the *V* gametes are eliminated; in typica plasm the segregation occurs normally. *A* is epistatic to all other factors, and *aa* moreover is not viable in minor plasm.

Peculiar marginal indentations resulting from local absence of palisade cells proved to be a simple dominant, *F*, and a type characterized by premature leaf shedding gave 1 : 2 : 1 ratios. A form without leaves on the inflorescence was due to a dominant factor *If*, transmitted only by the ovules.

The presence of the black patch on the flower was governed by a dominant factor *O*, *oo* being nonviable in minor plasm. *O* also produces a black patch on the stipules, and is necessary for the expression of the anthocyanin-producing allelomorphs z–Z_1–Z_2. These in turn are required for expression of dominant *X*, which gives the anthocyanin a bluish tint. The coloration due to the *Z* factors is more intense in minor than in major plasm.

The identity of the factor groups I^1–I_3, B_1–b, and T_2–t with those governing number of seeds was demonstrated, and the lethal nature of B_1B_1, T_2T_2, T_2T_1, and T_1T_1 was also confirmed. Behavior of fruit length in the various crosses indicated that at least four distinct factors were concerned. Crosses within the minor group showed that here one group of triple allelomorphs accounted for all differences observed. Much longer fruits were formed with major than with minor as the female parent. G_1–G_4 was responsible also for fruit length, and *B*, *T*, and *I* were also involved. It appeared that because of the combination of these factors, F_1 plants usually bore considerably longer fruits than the parents. The *G* factors were not expressed in the prostrate types. Fruit width similarly was correlated with leaf width and also depended on *G* and *W*. A factor *Q* gave normal leathery pods as opposed to rough wavy ones, and in presence of *Q* a further intensifying factor *S* transformed the normal into leathery pods which burst at maturity. Another pod factor, *D*, caused a pronounced development of downy hairs on the inner surface of the pods.

Seed size investigations were complicated by the fact that when the female parent had smaller seeds than the male, the seed coat restricted the development of the hybrid seeds, an effect even resulting in splitting of the seed coat. Distinct ratios by certain crosses in the second seed generation indicated that length and breadth of the seeds also were influenced by the *G* group. *B* and *T* exercised a special influence on the seed length and *W* on the breadth. The *T* factors seemed to displace the hilum from the center in one direction and *B* in the opposite direction. The seed size factors were expressed to a lower degree in minor than in major plasm.

The factors *K* for shiny seeds and *R* for black flecks on the seed margins were also observed. Seed color depends primarily on *O*. In the absence of *O* whitish gray seeds are produced which are converted by *Y* into yellowish-white. *O* and *P* gives yellow and with *p* purple seeds. The purple is more intense in minor than major, and *oo* is nonviable in minor plasm. A further factor *Sc* in presence of *O* produces black seeds, and a factor *M* causing mottling of the seeds is linked with *O*, on account of which *mm* is eliminated in certain crosses between major and minor. Mottling is manifested in plants possessing *O* only. Hilum color is governed by *N* but also is influenced somewhat by the other color factors.

A peculiar type of semisterile plant described was a simple recessive. A clearly defined zygotic sterility exceeding 25 per cent was observed in minor × major crosses, i. e., where the minor served as the female parent, but was not seen in the other crosses.

Of the 26 factors established and studied, 19 grouped themselves clearly into the 4 linkage groups (1) *O–M–A–B–E–Y–T*, (2) *S–P–Z–V*, (3) *L–N–C–F–Q*, and (4) *D-X-K*. The position of the genes in the 4 chromosomes is indicated.

Contributions to the genetics of Phaseolus vulgaris, K. Miyake, Y. Imai, and K. Tabuchi (*Jour. Col. Agr., Imp. Univ. Tokyo, 11 (1930), No. 1, pp. 1–20, pls. 2, fig. 1*).—Among observations made in this study at the Imperial University of Tokyo were that red stems invariably bear red flowers, while the green stems may bear red, pink, flecked, or white blooms. Flecked and white flowers acted as simple recessive characters to the self-colored condition. Black was the most potent seed-coat color, being epistatic to all other colors. Seed color was highly complicated, there being frequently a series of continuous, inseparable gradations of color in the hybrid progeny. White was a simple recessive to colored seed coats.

Chromosome relationships in the Pomoideae, K. Sax (*Jour. Arnold Arboretum, 13 (1932), No. 3, pp. 363–367, pl. 1*).—The 12 univalents usually found in triploid forms of Pomoideae are believed to indicate that this subfamily of Rosaceae is not an autopolyploid with a basic number of seven chromosomes, but may have originated from one or perhaps two of the other three subfamilies, Spiraeoideae, Rosoideae, and Prunoideae by hybridization between primitive forms followed by chromosome doubling in the F_1 hybrid. The available evidence indicated that the Pomoideae are allopolyploids.

Chromosome pairing in Larix species, H. J. Sax (*Jour. Arnold Arboretum, 13 (1932), No. 3, pp. 368–374, pl. 1, fig. 1*).—An analysis of chromosome pairing in *L. leptolepis* (*L. kaempferi*), *L. decidua,* and a hybrid of the two showed a remarkable similarity in chiasma frequency in all three forms. Chromosome distribution appeared regular in the hybrid, although there were a few cases where there was a weaker pairing in the homologues in one bivalent of the hybrid and pollen sterility was somewhat greater in the hybrid.

Meiosis and chiasma formation in Paeonia suffruticosa, K. Sax (*Jour. Arnold Arboretum, 13 (1932), No. 3, pp. 375–384, pl. 1, figs. 2*).—Defining chiasma

as the apparent change of partners among the chromatids at meiosis without reference to the origin of such configurations, the author states that in the species studied the homologous chromosomes may pair at meiosis without chiasma formation. When chiasmata were observed, the chromatids were often symmetrical in the bivalent chromosomes. Occasionally one or more homologous chromosomes were not paired at the first meiotic metaphase but passed to the poles as univalents.

Further studies of linkage in the sweet pea, R. C. Punnett (*Jour. Genetics, 26 (1932), No. 1, pp. 97–112, figs. 2*).—Data are presented on the manner of inheritance of 18 pairs of characters which were observed to arrange themselves into 5 linkage groups and 2 unassociated units. The haploid number of the chromosomes was 7. Deficiency of recessive characters was frequent in the F_2 generation. The author observed that the youngest mutations showed the most marked deficiency, and vice versa.

A somatic variation in the sweet pea, L. H. A. Stone (*Jour. Genetics, 26 (1932), No. 1, pp. 113, 114, pls. 2*).—The occurrence is recorded of a bud variation in the Cupid sweet pea in which the mutant branch was changed from a recessive to a dominant condition. Of 10 plants raised from seed of the mutant branch, 6 were tall and 4 dwarf like the Cupid parent.

Chromosome variation in Crocus, I, K. Mather (*Jour. Genetics, 26 (1932), No. 1, pp. 129–142, figs. 47*).—An examination and comparative study of the somatic chromosome complements of 64 species and varieties of Crocus indicated that chromosomal variation observed had resulted from (1) hybridization and polyploidy, (2) fragmentation and possibly fusion, and (3) genotypic changes controlling bulk and width of the chromosomes. The occurrence of certain species with an odd somatic number of chromosomes suggests that clonal propagation may have been relatively frequent.

Colour inheritance in swedes and turnips and its bearing on the identification of commercial stocks, V. M'M. Davey (*Scot. Jour. Agr., 14 (1931), No. 3, pp. 303–316*).—The genetic behavior of skin and flesh colors in swedes and turnips is described briefly, with comments based on experiments at the Scottish Plant Breeding Station. The importance of flower and flesh color in guarding against contamination of swede crops by swede-like rape is emphasized. Reference is made to the discovery by the author of duplicate factors for purple neck in swedes. The purple neck or purple top character of a white-fleshed strain was found to depend on a factor different from that causing a similar condition in the common yellow-fleshed strains.

General, group, and special size factors, S. Wright (*Genetics, 17 (1932), No. 5, pp. 603–619*).—The author presents a method for analyzing quantitative data to show how the effect of general size factors on specific characters may be estimated and how the influence of residual group and special factors may be calculated. Examples for the analysis were selected from rabbit and White Leghorn data. In all except one group of rabbits the influence of general size factors predominated. The operation of size factors for specific parts of the animals or even specific characters is also suggested.

Harelip, a new mutation in the house mouse, S. C. Reed and G. D. Snell (*Anat. Rec., 51 (1931), No. 1, pp. 43–50, figs. 2*).—The inheritance in mice of a condition designated as harelip, consisting of a cleft in the roof of the mouth, upper jaw, and hard palate is described. The character appeared to behave as a recessive factor subject to the influence of important modifying factors, making many overlaps and a deficiency in the number of homozygous individuals. Harelipped mice lived only a short time on account of the difficulties in nursing.

The growth of the pituitary body in the female rabbit, M. ALLANSON (*Jour. Expt. Biol., 9 (1932), No. 2, pp. 117–123, figs. 2*).—A linear relation was found between the weight of the pituitary gland and the cleaned body weight in 48 female rabbits and 31 male rabbits, indicating that the rate of growth of the pituitary showed no marked difference after puberty. Pituitary weights in 10 female rabbits also showed that there were no detectable differences in size after copulation.

Studies on the pituitary.—IX, Changes in blood calcium following injection of anterior lobe extracts and sexual excitement in female rabbits, L. HOGBEN and E. CHARLES (*Jour. Expt. Biol., 9 (1932), No. 2, pp. 139–148*).—The removal of the ovaries was found to have no influence on the calcium and magnesium content of the blood serum of normal rabbits, but the serum calcium was reduced in the female following copulation with a subsequent rise in serum calcium at the time of ovulation. Injections of saline suspensions of fresh ox pituitary also caused a reduction in the calcium content of the blood serum.

Experimental studies of the anterior pituitary.—II, The occurrence of pregnancy cells in mice following continuous anterior-lobe administration, H. O. HATERIUS and H. A. CHARIPPER (*Anat. Rec., 51 (1931), No. 1, pp. 85–101, figs. 7*).—Implantation of pituitary grafts on nine successive days in female mice or in castrated males in which ovaries had been transplanted caused luteinization of the ovaries and the production of pregnancy cells in the hypophysis. Without the presence of ovarian tissue, as in normal and castrated males and castrated females, pregnancy cells were not found in the anterior lobe of the hypophysis.

Comparison of the capacity of anterior-hypophyseal tissue of mature and immature female rabbits to induce ovulation, J. M. WOLFE and R. CLEVELAND (*Anat. Rec., 51 (1931), No. 2, pp. 213–218*).—In testing the comparative amounts of anterior-hypophysial tissue of mature and immature rabbits required to induce ovulation, it was found that when mature rabbits served as the donors 2.5 mg of anterior-hypophysial tissue induced ovulation in 9 of 17 rabbits injected and 5 or 10 mg caused ovulation within 24 hours in all the rabbits. When the donors were from 10 to 14 weeks of age, 2.5 mg of the hypophysial tissue caused ovulation in 3 of 10 rabbits injected, while 5 mg caused ovulation in 13 of the 14 test animals. The use of a small number of 4- to 5-week-old donors indicated that the anterior-lobe tissue was still less effective in inducing ovulation.

Effects of continued estrin injections on young rats, J. SPENCER, F. E. D'AMOUR, and R. G. GUSTAVSON (*Amer. Jour. Anat., 50 (1932), No. 1, pp. 129–139, pl. 1, figs. 2*).—Groups of male and female rats 3 to 4 weeks of age were given daily doses of 20 rat units of oestrin for 54 days. The growth in weight, in skeleton, and especially of the gonads was materially reduced by the treatment as compared with controls. Recovery in weight was rapid, and fertility was normal after 2 months.

Gonad hormone functions and the reciprocal influence between gonads and hypophysis, with its bearing on the problem of sex hormone antagonism, C. R. MOORE and D. PRICE (*Amer. Jour. Anat., 50 (1932), No. 1, pp. 13–71, figs. 15*).—From studies of the hypophysis and gonadal interrelationships by injections of the male and female hormone singly and in combination into normal and castrated animals of both sexes, the following principles were established:

"(1) Gonad hormones stimulate homologous reproductive accessories, but are without effect upon heterologous accessories; (2) secretions produced by the hypophysis stimulate the gonads to function both in germ cell production

and in hormone secretion; (3) gonad hormones have no direct effect on the gonads of either the same or the opposite sex; (4) gonad hormones of either sex exert a depressing effect upon the hypophysis, which results in a diminished amount of the sex-stimulating factor available to the organism." Studies of hypophysectomized animals and rats on deficient or excessive vitamin B rations tended to confirm these findings.

Cowper's gland and its reaction to castration and to different sex-hormone conditions, R. E. Heller (*Amer. Jour. Anat., 50 (1932), No. 1, pp. 73–95, pl. 1, fig. 1*).—In studies of the reaction of Cowper's gland to castration in rats and guinea pigs, it was found that atrophy of the gland could be detected within about 10 days after castration. The atrophy was prevented by injection of the testis hormone, and precocious development of the gland was stimulated by fresh hypophysial implantations or injections of the gonad-stimulating hormone from pregnancy urine in young animals. The responses of the gland to the administration of oestrin and the testicular hormone were in accord with the principles established by Moore and Price for the accessory sex glands, as reported in the above paper.

Studies on the physiology of lactation.—I, The relation of lactation to the ovarian and hypophyseal hormones, W. O. Nelson and J. J. Pfiffner (*Anat. Rec., 51 (1931), No. 1, pp. 51–83, figs. 10*).—In studies of the physiology of milk secretion in guinea pigs, rats, and rabbits it was found that the follicular hormone was necessary for developing the breast to the pubertal condition. Subsequently the corpus lutein hormone induced the growth of the gland during early gestation. The final growth of the gland terminating in lactation was induced by the hormone of the anterior lobe of the pituitary. It also appeared that the hormone of the placenta played a part in inhibiting lactation until after parturition.

The tests were conducted with normal and gonadectomized mature and immature males and females, and the different extracts and pituitary transplants were administered singly and in combination. The measurements of the nipples and glands before and after the treatments and histological studies served as a criterion of the influence of the treatments. There seemed to be no sex specificity exhibited by the gland tissue.

The relation of the volume of the amniotic fluid to the weight of the fetus at different stages of pregnancy in the rabbit, W. A. Lell (*Anat. Rec., 51 (1931), No. 2, pp. 119–124, figs. 2*).—Data are reported on the weights of the fetuses, placentas, and membranes, and the amount of amniotic fluid present in 12 rabbits ranging from 20 to 30 days of gestation. The fetuses increased rapidly in weight during the last 10 days of pregnancy. The placenta and membranes increased slightly until the twenty-fourth day, following which there was no further increase. The amniotic fluid increased slightly until the twenty-sixth day of gestation, after which there was a rapid decrease.

The effect on a subsequent pregnancy after X-raying one ovary of a rat, R. I. Pencharz and J. A. Long (*Amer. Jour. Anat., 50 (1932), No. 1, pp. 1–11, pl. 1, figs. 2*).—The data are reported on 24 rats in which one ovary was drawn through an abdominal incision and X-rayed for from 15 to 60 minutes. The animals were later bred, and the normal ovary was removed during gestation with the result that abortion or resorption followed within 24 to 48 hours, except in one case, in which the normal ovary was not removed until the nineteenth day of gestation. The X-rayed ovaries contained what appeared to be luteal tissue, interstitial tissue, and degenerate follicles, leaving some doubt as to what in the ovaries permits carrying the fetus through the entire gestation period.

FIELD CROPS

Crop rotation as a material aid to soil productiveness, C. B. Williams (*North Carolina Sta. Agron. Inform. Circ. 73 (1932), pp. [1]+3*).—The advantages of crop rotations in improving soil fertility are pointed out, with examples of increased crop yields in rotations on Piedmont and Coastal Plain soils. It is pointed out that rotations to be effective must be supplemented by other factors such as fertilization and proper handling of the crops.

The influence of fertilizers on crop quality, B. L. Hartwell (*Natl. Fert. Assoc. Proc., 8 (1932), II, pp. 1–60*).—Research concerned with the effects of nitrogen, phosphorus, potassium, complete fertilizer, and miscellaneous elements on various aspects of quality in agricultural crops is reviewed. The several sections consider the contents of protein, carbohydrates, fats and oils, fiber quality, vitamins and enzymes, physical characters, size and density of fruiting parts, reproductive functions, disease susceptibility, maturity, keeping quality, flavor and aroma, color, cooking quality of potatoes, quality of bread grains, beverages, and smoking tobacco. An index and a bibliography embracing 389 titles are appended.

A device for use in determining the moisture content of drying forages, E. R. Henson (*Jour. Amer. Soc. Agron., 24 (1932), No. 8, pp. 637–641, figs. 2*).—By using a weighing device constructed at the Iowa Experiment Station, the moisture contents of rather large quantities of hay may be obtained at desired intervals without changing their normal exposure. Comparison of moisture contents of swath-cured and windrow-cured hay at different times during four days of curing showed the weighing device to give a more uniform picture of the condition of the hay than is secured from shrinkage samples. It would appear difficult to sample half-dried hay in the windrow with accuracy. Swath-cured hay seems to cure out more evenly, and successive shrinkage samples do not appear so erratic. Green hay may be sampled rather accurately by the use of shrinkage samples. The use of a device to be operated by one man might permit a farmer to determine when his hay is safe to bale or store in the mow.

[Field crops experiments in Alaska, 1931] (*Alaska Col. Sta. Bul. 1 (1931), pp. 11, 15–22*).—Notes are given on experiments with field crops at Fairbanks in 1931, including production tests with native grasses, especially *Calamagrostis scabra*, potatoes, perennial vetch, yellow-flowered and variegated alfalfa, Siberian red clover, and alsike clover, and breeding work with wheat.

[Field crops work in Tennessee], C. A. Mooers, L. S. Mayer, S. H. Essary, H. P. Ogden, B. D. Drain, and B. P. Hazlewood (*Tennessee Sta. Rpt. 1931, pp. 10, 11, 12–16, 20–22, 26–29, 50, 56, 59–61*).—Agronomic investigations reported on from the station and substations (E. S. R., 65, p. 825) embraced variety trials with cotton, corn, wheat, oats, rye, potatoes, sweetpotatoes, millet, lespedeza, red clover, sweetclover, alfalfa, soybeans, and kidney beans; breeding work with corn, sweet corn, oats, and cotton; inheritance studies with corn, cotton, and red clover (resistance to anthracnose); cultural (including planting) experiments with cotton, corn, oats, potatoes, lespedeza, sweetclover, and soybeans; fertilizer tests with crops in rotation, corn, cotton, sweetpotatoes, and tomatoes; effect of cowpeas as a green manure for wheat; liming experiments; crop rotations; study of corn, sorghum, and cotton grown continuously with various treatments; adaptation, production, seed treatment, and feeding tests with the perennial lespedeza (*L. sericea*); study of cotton lint from different sections of the State and from different parts of the boll;

pasture experiments; and weed-control studies. Certain phases of the work were in cooperation with the U. S. Department of Agriculture.

[Field crops experiments in Utah] (*Utah Sta. Bul. 235 (1932), pp. 31–34, 35–38, 39, 40, 41, 42, 43, 55, 74, figs. 7*).—Agronomic research (E. S. R., 63, p. 630) reported on from the station and substations for the biennium ended June 30, 1932, included variety trials with spring and winter wheat, corn, oats, barley, grain sorghum, and potatoes; breeding work with wheat and alfalfa; cultivation and fertilizer trials with sugar beets; a fertilizer test with barley; crop rotations; weed-control studies; and range-reseeding experiments, including a spacing test with mountain bromegrass. Other wreat investigations dealt with tillage, cultivation, manuring, green manuring, seed treatments, stubble burning, mineral content of grain, and genetic behavior. Certain lines of work were in cooperation with the U. S. Department of Agriculture.

Preliminary list of the more common grasses of Southern Rhodesia, S. M. Stent (*Rhodesia Agr. Jour., 28 (1931), No. 4, pp. 342–359, pls. 2*).—A preliminary survey of the botanical composition of grazing areas of Southern Rhodesia enabled the author to list common grasses of the black land, sand veld, vlei land, and red soil, and to indicate their characteristics and in some cases their merits.

Seeds mixture trials in hay crops.—I, Interrelation of different species and reaction toward environmental factors [trans. title], G. Nillson-Leissner (*Sveriges Utsädesför. Tidskr., 41 (1931), No. 5, pp. 313–339; Eng. abs., pp. 337–339*).—Early and late red clover, alsike, alfalfa, timothy, orchard grass, meadow fescue, tall oat grass, and bromegrass were grown in pure cultures and in various mixtures from 1922 to 1928.

The contents of the grasses in the harvested mixtures did not follow variations in the seeding rates. Meteorological conditions during the preceding winter and the current summer were the main factors affecting relations between legumes and grasses in the mixtures, and such influences were seen best in the first cutting of each year. The winter hardiness of the legumes depended largely upon the time of the final cutting of the preceding year. Late cuttings usually yielded less than earlier ones, but the hay had a higher legume content. When harvested for two years, mixtures containing late red clover gave the best total yield and were followed in order by alfalfa with timothy and with meadow fescue. Grasses yielded better in the second than in the first year. Alfalfa and grasses in mixtures together yielded less than they did in pure cultures.

The influence of continued heavy grazing and of promiscuous burning on spring-fall ranges in Utah, G. D. Pickford (*Ecology, 13 (1932), No. 2, pp. 159–171, figs. 4*).—The spring-fall range in Utah, including the lower mountain slopes and the adjacent foothills and valley fringes, has been grazed heavily for longer than 40 years. In studies by the Intermountain Forest and Range Experiment Station, areas of spring-fall range long protected from grazing and fire supported a good cover of plants palatable to livestock, including perennial grasses, chiefly blue bunch wheatgrass, beardless wheat, blue stem wheat, Sandberg's bluegrass, and Nevada bluegrass. Such perennial grasses represented 49 to 81 per cent of the total plant cover, whereas sagebrush averaged slightly less than 10 per cent. Annual grasses, principally downy brome, weeds, and shrubs other than sagebrush, were relatively unimportant.

On promiscuously burned areas long protected from grazing, burning tended to deplete the stand of perennial grasses and to allow annual grasses, chiefly downy brome, to increase sharply in density, while the sagebrush cover

was largely destroyed. Burned protected plats resembled those totally protected in total plant density, although slightly lower in grazing capacity. On range both promiscuously burned and heavily grazed the total density of plant cover was seriously reduced, and the stand of perennial grasses and the sagebrush cover were reduced about 85 and 80 per cent, respectively. Annual grasses and poor perennial and annual weeds were predominant. These changes in plant cover caused a reduction of over 50 per cent in grazing capacity. Range areas subjected to heavy grazing only showed serious depletion of perennial grasses, a decided increase in density of sagebrush, sometimes a sharp increase in density of poor perennial weeds and annual grasses, and a decrease in total plant density, vegetational changes resulting in reductions of 40 to 75 per cent in the grazing capacity of the areas studied.

The effect of top-dressing with artificial fertilisers on the annual yield, botanical composition, and carrying capacity of a natural pasture over a period of seven years, H. C. Trumble and K. M. Fraser (*Jour. Dept. Agr. So. Aust., 35 (1932), No. 12, pp. 1341–1353, figs. 6*).—Natural pastures at Waite Agricultural Research Institute, an association dominated by wallaby grass (*Danthonia* sp.) and representative of the noncultivated natural pastures of the Adelaide plains and the lower foothill slopes, were top-dressed with rock phosphate, superphosphate, basic slag, and superphosphate with sodium nitrate.

Each treatment increased the herbage yield and, except rock phosphate, substantially increased this yield during the first and later seasons. The greatest gain was obtained from annual dressings of superphosphate with sodium nitrate. In the last two years, increases due to this combination and to basic slag were maintained much better than with superphosphate alone. The soluble phosphorus carriers produced marked changes in botanical composition. The dominant perennial Danthonia was depressed and a succession of exotic species induced. The annual clovers were dominant during the first two years and in the sixth and seventh years a rosette species was dominant, whereas untreated pasture remained dominantly a Danthonia turf. The carrying capacity as measured in sheep days per plat followed fairly closely the total yield of herbage.

Effect of nitrogenous fertilisers on the growth and yield of wheat and barley, A. E. V. Richardson and E. F. Fricke (*Jour. Dept. Agr. So. Aust., 35 (1931), No. 1, pp. 57–86, figs. 8*).—On permanent rotation plats at the Waite Agricultural Research Institute with the rainfall ranging from 15 to 18 in. during the growing period, wheat in rotation with oats and peas or with barley and peas over a 6-year period yielded as much as or exceeded wheat alternating with bare fallow. The higher yields in comparison with wheat after bare fallow indicated that, in a region of liberal winter rainfall, nitrogen is more important than in the drier districts. When nitrogenous fertilizers supplemented the customary phosphatic dressing, wheat on a good bare fallow did not respond to nitrogen, while wheat following natural pasture or a cereal crop gave significant increases over no-nitrogen checks. The fallow soil at planting contained a larger supply of available moisture and of nitrates than the stubble soil.

Barley after cereals responded markedly to nitrogen applications, although dressings heavier than 1 cwt. per acre materially increased the nitrogen in the grain and reduced its quality for malting. While the increment in acre yield of total produce and grain of barley became successively smaller with each addition of fertilizer, the total quantity of nitrogen absorbed by the crop was approximately proportional to the quantity applied. The main effects on the growing crop were to increase the number of spike-bearing tillers and, especially with wheat, the number of spikes per plant at harvest.

Cross-inoculation studies with species of the genus Rhizobium on the roots of Florida legumes, W. R. Carroll (*Science, 76 (1932), No. 1957, p. 15*).—Satisfactory cross inoculations were made on cowpeas (*Vigna sinensis*) with nodule bacteria isolated from *Crotalaria alata, C. falcata, C. hildebrandtii, C. incana, C. intermedia, C. maxillaris, C. mundyi, C. oocarpa, C. polysperma, C. rotundifolia, C. spectabilis,* and *C. mysorensis.* Bacteria from nodules of *Erythrina herbacea, Clitoria ternatea, Aeschynomene americana,* and *Calopogonium mucunoides* also produced good nodules on the roots of *V. sinensis.* Attempts to make similar cross inoculations with cultures from *Crotalaria unagyroides* and other species failed or were unsatisfactory. Bacteria isolated from nodules on roots of *Trifolium procumbens* gave good inoculation on the roots of *T. hybridum.*

The resistance of certain varieties and regional strains of alfalfa to controlled low temperatures, F. L. Timmons and S. C. Salmon (*Jour. Amer. Soc. Agron., 24 (1932), No. 8, pp. 642–655, fig. 1*).—Several hundred plants of each of several varieties and strains of alfalfa were grown in the field, transplanted, and frozen under controlled conditions at the Kansas Experiment Station in the fall and early winter of 1929–30 and 1930–31. In resistance the alfalfas ranked (1) Provence (F. C. I. 34886) and Hardistan, (2) Grimm and Ladak, (3) Dakota, Nebraska, and Colorado commons, (4) Kansas, Utah, Idaho, and Oklahoma commons, and (5) strains from Arizona, New Mexico, and California. The resistance of the several strains to low temperatures in general was found to correlate well with the severity of the winters of the regions to which they had become adapted. The relative injury to the different varieties could be estimated very satisfactorily in most cases. The correlation between estimated injury and dead plants was found to be $r=0.970\pm0.010$ and between estimated injury and dead and severely injured plants 0.956 ± 0.015. The survival of Hardistan and Provence exceeded that expected on estimated injury.

A study of various factors influencing seed production in alfalfa (Medicago sativa), V. Engelbert (*Sci. Agr., 12 (1932), No. 10, pp. 593–603, figs. 6*).—Agencies affecting the tripping of alfalfa pollen and climatic factors related to seed production were studied at the Ontario Agricultural College.

The bees *Andrena wilkella* Kby. and *A.* (*Trachandrena*) *crataegi* Robtsn. were found to trip the flowers, and the last-named species thereafter also gathered the pollen. Among the sweat bees, *Halictus provancheri* D. T. tripped the flowers, and like *H.* (*Chloralictus*) *albipennis* Robtsn., gathered pollen from tripped flowers. The amount of pollen and its relative sterility appeared to influence the individual plants and were at least partly responsible for differences in seed production. Very little tripping occurred on sterile plants, none of which produced pollen. The superior seed-producing ability of certain plants seemed due in part to the vigor and rapidity of the germination of their pollen over a wide range of conditions. Fields with thin stands were always the best set with brown well-developed pods and made the highest seed yields, while the poorest yields were obtained from crowded stands. In Wellington and Peel Counties, Ontario, the limiting climatic factor appeared to be the amount and distribution of summer rainfall. Excessive rainfall in July appeared to cause failures of seed production, whereas a limited rainfall in July provided the best condition for seed production.

Lucerne in England and Wales, H. G. Thornton (*Jour. Min. Agr. [Gt. Brit.], 39 (1932), No. 5, pp. 420–428, figs. 5*).—Of 46,120 acres in alfalfa in England and Wales in 1931, 64.5 per cent was in the southeast counties. The relatively rapid increase in alfalfa growing in the midland, south, and southwest areas showed that the inoculation method was beginning to achieve its object

by extending alfalfa culture in areas responding to inoculated seed (E. S. R., 60, p. 636).

The quantitative development of tops and roots in bluegrass with an improved method of obtaining root yields, C. J. Willard and G. M. McClure (*Jour. Amer. Soc. Agron., 24 (1932), No. 7, pp. 509–514*).—By the use of a method for correcting yields of grass roots for soil not removed by washing, samples of bluegrass roots washed as thoroughly as possible were found to contain from 7.4 to 42.5 per cent of included soil. Bluegrass sown alone late in the fall produced by the next June 8 a total of 6,660 lbs. of roots and tops per acre on an unfertilized area and 9,810 lbs. on a fertilized area. Underground parts continued to increase until fall, when they averaged about 2 tons per acre, and at all times contained a higher percentage of nitrogen than the tops. Both tops and underground parts from plats heavily fertilized with nitrogen contained more nitrogen than those from unfertilized areas, the difference being especially marked in underground parts after the first cutting. The heavy nitrogen fertilization decreased greatly the relative amount of underground parts. The amount of roots in the fertilized area was notably less for a period after fertilizer application, but about equaled that in the unfertilized area toward the end of the season.

The relation of agronomic practice to the quantity and quality of the oil in flaxseed, I. J. Johnson (*Jour. Agr. Research [U. S.], 45 (1932), No. 4, pp. 239–255, figs. 2*).—Bison and Diadem flax were grown on the Minnesota Experiment Station on a part of the wheat plats of a 5- and a 3-year rotation and on a plat continuously cropped to wheat. Daily seed and boll measurements indicated a more rapid rate of growth during the first week after flowering on the poorer soil (continuous wheat plat), but after maximum seed and boll size was reached these characters did not differ consistently on either plat. The daily increase in dry weight of seed was similar on soils of different productivity during the period of most rapid increase in seed weight. From then to maturity (about 7 days) Diadem seed grown on continuous cropping was significantly smaller than from the rotation plats, while Bison seed was about the same from each plat, suggesting a varietal response to soil fertility, Bison probably being the better suited to poorer soil. Growth curves from averages of the 3 plats showed that length, width, and thickness of the seed and length and diameter of the boll increased rapidly, attaining an approximate maximum size for both flaxes 9 days after flowering, remained fairly constant for some time, and then decreased slightly with complete maturity. Daily increase in dry weight of seed progressed fairly uniformly until 24 days after flowering for Bison and 28 days after for Diadem, and then increased slightly to complete maturity.

The average oil content of Bison, studied at 2-day intervals, increased fairly uniformly from 5 to 25 days after flowering, followed by a slight decrease to maturity. Iodine numbers increased rapidly from 5 to 17 days after flowering, remained fairly constant for a short period, and then decreased slightly to complete maturity.

When the Redwing, Bison, Winona, and Buda varieties were sown during 1929 and 1930 at 5 successive 10-day intervals beginning May 1, the seed yield was reduced greatly because of delayed planting, and usually the smaller yield was followed closely by reduction in number of seeds per boll and bolls per plant, which may explain the lowered yield from late-planted flax. A very slight reduction in oil content accompanied delayed planting in 1929 but no consistent differences in 1930. The iodine number in 1930 indicated a slight

decrease with delayed planting for Bison but no significant change for Redwing. A difference in varietal response to delay in planting was suggested; Redwing and Winona showed less reduction in yield than did Bison and Buda.

Hemp fibres ([*Gt. Brit.*] *Imp. Econ. Com. Rpts., 24 (1932), pp. 99, figs. 2*).—This report treats of the uses, production, preparation, trade and manufactures, and marketing of Manila, sisal, henequen, Indian (sunn), New Zealand, and Mauritius hemps in the several divisions of the British Empire. Statistics on the commercial movement of these fibers are also included.

Morphological varietal characters of the potato [trans. title], G. Øverby (*Årsberet, Norges Landbr, Høiskoles Åkervekstforsøk, 39 [1927–28], pp. 17 115, figs. 10*).—Descriptions of the tuber, plant, leaf, and flower characters are given for 98 sorts of potatoes, 35 of the more important varieties being treated in greater detail. The bibliography of literature dealing with potato varieties includes 96 titles.

The healing of potatoes skinned during harvest as affected by temperature, humidity, and solar and sky radiation, W. M. Peacock (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 266–269*).—Darkening of skinned areas of Irish Cobbler potatoes under the midday climatic conditions of September 2 to 11, at Arlington, Va., on fair days became slightly perceptible within 2 hours after exposure for 1 hour or longer. This type of injury increased until the skinned areas became brown or black, within 24 hours, according to the length and time of exposure, regardless of whether the tubers were left in the field or stored in temperatures ranging from 32 to 90° F. One-half hour exposure at midday or early morning or late afternoon exposure apparently did not affect the normal healing of the skinned areas. Practical conclusions were that, to prevent discoloration of skinned areas on clear days during summer harvest, potatoes preferably should be dug early in the forenoon or late in the afternoon. Potatoes dug during midday should be picked up almost immediately and protected from the sun.

Effects of light and temperature on the growth and tuberization of potato seedlings, J. H. Beaumont and J. G. Weaver (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 285–290, pl. 1, fig. 1*).—Experience had shown that potato tubers could be grown to the size of a walnut on seedling potato plants in 3.5-in. pots in the greenhouse, and that these tubers when properly afterripened germinated and grew in the field as satisfactorily as transplanted plants. Experiments at the North Carolina Experiment Station involving two growth temperatures and light exposures from the regular day up to 18 hours showed 15 hours of light exposure in a cool greenhouse (50° F. at night and 60° in the day) to be the most favorable for tuberization and early maturity.

Propagating sorghum by cuttings, H. E. Rea and R. E. Karper (*Amer. Jour. Bot., 19 (1932), No. 6, pp. 464–476, figs. 2*).—Stem cuttings, including stripped and unstripped two-node cuttings and stripped many-node cuttings, were made of 12 types and varieties of sorghum and 1 variety of corn at the Texas Experiment Station. The two-node cuttings were propagated in glass jars, and the many-node cuttings were heeled in the open greenhouse bed, the latter method proving the more successful. Broomcorn appeared to be the best adapted to propagation by cuttings, but honey sorgo and Tunis grass also were very successful, while other sorghums varied considerably in this respect. The grass sorghum cuttings generally were successful and were exceeded only by broomcorn. The sorgo group showed considerable variation, while the grain sorghums produced the fewest satisfactorily rooted cuttings. Cuttings from corn produced roots from the root band but did not develop shoots.

Variety tests of sugarcanes in Louisiana during the crop year 1930–31, G. Arceneaux, I. E. Stokes, and R. B. Bisland (*U. S. Dept. Agr. Circ. 242 (1932), pp. 27*).—Comparative plantation tests with promising sugarcane varieties made during the crop year 1930–31 to determine their relative adaptation to various soil conditions in the Louisiana cane-growing area are reported on as heretofore (E. S. R., 66, p. 429).

The outstanding observation in these tests was the fact that the heretofore satisfactory P. O. J. 213 variety showed signs of decreased production due to the effect of red rot, particularly in plant cane. Weather conditions during the spring of 1931 appeared to be extremely conducive to losses by red rot, and possibly much better results would be obtained with the variety under normal conditions. It appeared probable that although P. O. J. 213 had been widely accepted by Louisiana growers as a standard variety, other varieties, namely, P. O. J. 36–M, Co. 281, and C. P. 807, which have proved superior in several respects to P. O. J. 213 at its best, might be available to replace P. O. J. 213.

P. O. J. 234 continued to lead other released varieties in yield of sugar per ton of cane, and it appeared desirable to have a certain part of the acreage in this variety for early grinding. P. O. J. 36–M continued to give good results and to surpass P. O. J. 36. It is better adapted for cultivation in the western than in the eastern parishes. C. P. 807 gave high cane yields under all usual soil and drainage conditions and demonstrated its commercial value on the poorly drained heavy soils consisting of Sharkey clay or related types. Its merits and demerits are pointed out. Co. 281 outyielded all other varieties except P. O. J. 234 in sugar per ton of cane. Its comparative low yields of cane in the western parishes indicate that its extensive cultivation should probably be limited to the eastern section where it can be grown to advantage on a considerable part of the light and mixed soils previously growing P. O. J. 213. Co. 290 made vigorous growth in limited plant-cane tests and approximated C. P. 807 in yields of cane, but in yield of sugar per ton of cane proved generally inferior to P. O. J. 36–M, P. O. J. 213, and C. P. 807. Co. 281 showed milling properties approximately equal to those of the P. O. J. varieties, and while C. P. 807 gave somewhat less satisfactory results due to its higher fiber content, no unusual difficulties were encountered in milling it.

Relation of calcium and magnesium to the growth and quality of tobacco, J. E. McMurtrey, jr. (*Jour. Amer. Soc. Agron., 24 (1932), No. 9, pp. 707–716, figs. 4*).—This discussion of the needs of tobacco for calcium and magnesium, symptoms of their deficiency, and their effects on yield and quality is based largely on results reported earlier by the author and others (E. S. R., 48, p. 454; 58, p. 328; 60, p. 300; 62, p. 721) and by Murwin (E. S. R., 61, p. 136).

Tobacco fertilizer recommendations for 1933, C. B. Williams et al. (*North Carolina Sta. Agron. Inform. Circ. 72 (1932), pp. [2]+3*).—Fertilizer analyses, rates of application, and sources of plant foods are recommended for fertilizers for bright flue-cured and dark (sun-cured and shipping) tobacco and for plant beds on tobacco soils in Virginia, North Carolina, South Carolina, and Georgia.

Studies of wheat varieties, culture, and selection, C. K. McClelland (*Arkansas Sta. Bul. 278 (1932), pp. 34, figs. 3*).—Experiments with wheat reported on for 1915 to 1931, inclusive, supplement the work noted earlier (E. S. R., 33, p. 137).

Wheat yields showed an upward trend since 1920, due in part to favorable seasonal conditions in 1930 and 1931, but mainly to gradual improvement of

soil by rotation and manurial practices. Studies of the relation of climatic factors to wheat yields suggested that differences in precipitation, for any limited time at least, did not affect yields much. Correlations with temperature were not significant, except with the average minimum for February—as temperatures went down yields also fell.

Red Wonder, Early Ripe, Mediterranean, Fultz, Poole, Bluestem, and Red May appeared to be superior varieties for Arkansas. Early soft red wheat surpassed the later maturing varieties, and hard red wheat averaged low in yield index. Wheat grown in Arkansas usually showed good quality as measured by weight per bushel. It seemed that with the general increase in fertility of soil and yield came an increase in weight per bushel and better grade. The percentage of grain weight to bundle weight varied from 26.4 in 1924 to 42.2 in 1929, while variety averages ranged from 33.3 to 38.9 per cent over 11 years, averaging 36.3 per cent. Cultural tests favored drilling from 6 to 7 pk. per acre, seeding about October 1, and planting fairly deep.

A classification of South Australian wheat varieties, H. C. Gurney (*Jour. Dept. Agr. So. Aust., 35 (1932), No. 11, pp. 1178–1196, figs. 5*).—Wheat varieties numbering 110 are described from material grown at Waite Agricultural Research Institute and are classified, using criteria similar to the classification of Clark, Martin, and Ball (E. S. R., 49, p. 634) in the major divisions.

Root development in hardy and non-hardy winter wheat varieties, W. W. Worzella (*Jour. Amer. Soc. Agron., 24 (1932), No. 8, pp. 626–637, figs. 6*).—Root systems of four nonhardy (Fultz, Michigan Amber, Rudy, and Red Cross) and four hardy varieties (Kanred, Kharkof, Michikof, and Purkof) of winter wheat grown in the field at the Indiana Experiment Station were examined at intervals during 1929–30 and 1930–31. The amount of root development in fall and early spring was influenced greatly by seasonal conditions. In a warm and dry season the roots grew more rapidly and penetrated deeper than in a cooler and wetter season. It was observed that winter wheats grown under field conditions possessed two types of root systems. In the nonhardy sorts studied, many of the seminal roots were found to develop almost horizontally in the early growth stage and then turn downward, while other roots run obliquely outward. In general in the hardy wheats studied, most of the seminal roots ran obliquely outward or straight downward. While adventitious roots did not develop extensively in the fall, they increased greatly in number and growth in the spring. The nonhardy varieties showed a greater top growth in the fall and early winter, from October 1 to February 22, than the hardy wheats.

The comparative resistance of wheat varieties to sprouting in the stook and windrow, J. B. Harrington (*Sci. Agr., 12 (1932), No. 11, pp. 635–645, figs. 4*).—The kernels of wheat varieties, subjected to rainy weather in shocks for 10 days following harvest September 30, 1927, and in semiprotected piles for 12 days after harvest September 11, 1931, were examined at the University of Saskatchewan. The amount of sprouting varied widely between varieties—Marquis sprouting the least and Garnet the most. The respective percentages of kernels that did not sprout in 1927 and 1931 were in Marquis, 95.1 and 43.4; in Reward, 76.3 and 37.6; in Garnet, 7.4 and 3.3; and in Ceres (1931), 29.97.

Correlational and allied studies of the protein content, water absorption, loaf volume, and loaf weight of two series of hard red spring wheats, L. R. Waldron and C. E. Mangels (*Jour. Agr. Research [U. S.], 45 (1932), No. 4, pp. 209–231, figs. 4*).—One series of hard red spring wheats (nursery),

diverse in genetic origin but grown under uniform soil and soil treatment conditions, and another consisting of the Ceres variety grown on plats subjected to different rotations and fertilizer treatments were compared for the crops 1927 to 1930, inclusive, at the North Dakota Experiment Station, in regard to the means, coefficient of variability, correlations, and regression equations relative to protein content, water absorption of flour, and volume and weight of loaf.

The nursery wheat exceeded the plat samples in flour-protein content, evidently due to the preceding sweetclover crop. Unweighted means of water absorption, loaf weight, and loaf volume were very close together. The variability of protein content of wheat from the plats showed distinctly the greater variability for the four years, while the nursery series usually showed greater variability in water absorption, loaf weight, and loaf volume. Protein content appeared to respond readily to soil differences, whereas water absorption, loaf weight, and loaf volume respond to varietal differences.

The protein-volume correlations exceeded those between others of the 6 pairs of characters studied, and those from the plats surpassed the nursery samples, and significantly in 11 of 16 comparisons. A more direct relationship evidently exists between protein and loaf volume in a commercial mill, where one variety more often dominates the blend in a mill mix than in a genetically diverse group of wheats grown experimentally.

As to the relationships of protein and weight, and volume and weight, the correlations were generally negative and sometimes distinctly significant. For 3 years the correlations between protein in wheat and loaf volume, and protein in flour and loaf volume, showed no material differences. The volume-protein regressions were significant in practically all cases, both total and partial, and generally very distinctly so. Of 16 cases of the volume-weight regressions, 10 of the 13 negative coefficients were significant. Correlation coefficients by themselves, it appears, do not suffice to show to what extent loaf volume depends on protein content. Regression coefficients seem necessary for a proper interpretation.

Weed survey of the prairie provinces, J. M. MANSON (*Canada Natl. Research Council Rpt. 26 (1932), pp. 34, figs. 7*).—The prevalence and severity of infestations of perennial sow thistle, Canada thistle, wild oats, wild mustard, stinkweed, couch (quack) grass and poverty weed in Manitoba, Alberta, and Saskatchewan are indicated on outline maps and discussed from surveys made in 1930 and 1931. The relation of clean planting seed and cultural methods to weed control is pointed out, with remarks on weed inspection and on the constitution of grain screenings.

Spraying and dusting experiments with weeds in 1926 and 1927 [trans. title], P. BOLIN (*Meddel. Centralanst. Försöksv. Jordbruksområdet [Sweden], No. 336 (1928), pp. 112, figs. 2; Eng. abs., pp. 101–104*).—Further investigations in Sweden (E. S. R., 56, p. 40) demonstrated that 3.5 per cent solution of sulfuric acid at the rate of 800 l per hectare was cheaper than and as effective in weed control as 20 per cent iron sulfate solution and was preferable. An addition of 10 per cent of ammonium sulfate to the sulfuric acid gave inferior weed control although it increased grain yields. Dusts, i. e., powdered iron sulfate and calcium sulfate, were about as effective as sprays but were unreliable. Sprays of 20 per cent solution of sodium nitrate, at the rate of 800 to 1,200 l per hectare, resulted in so much lodging as to outweigh favorable decreases in stand and vigor of weeds. Compared with sulfuric acid, sodium chlorate was a better herbicide but resulted in smaller yield increases.

HORTICULTURE

[Horticulture at the Alaska College Station] (*Alaska Col. Sta. Bul. 1 (1931), pp. 12–15*).—A brief statement is given of projects dealing with the selection and testing of promising plants of native blueberries, currants, and raspberries.

[Horticultural investigations at the Tennessee Station], C. A. Mooers, S. H. Essary, B. D. Drain, H. P. Ogden, and B. P. Hazlewood (*Tennessee Sta. Rpt. 1931, pp. 11, 12, 16–18, 22, 23, 29–34, 48, 49, 50, 56, 57, 61, 62*).—Brief reports are given upon the results of studies in the improvement of garden peas by crossing with the Austrian winter pea, lime, inoculation, and fertilization experiments with garden peas, orchard fertilization, inheritance in the strawberry, sweet corn double crosses, the relation of the date of seeding to yield of tomatoes, the effects of soil treatment on yield of greenhouse tomatoes, the relative value of dusting and spraying in the control of tomato leaf spots, trials with the new station strawberry McClintock, rootstocks for peaches and apples, open-pollinated seedlings of the Van Fleet raspberry, tests of the Vainqueur peach and Methley plum, and the propagation of rhubarb with a view to increasing disease-resistant stocks.

In addition studies were carried on at the Mericourt Substation upon cultural practices with tomatoes and strawberries and upon the spacing of pyrethrum plants, and at the West Tennessee Substation with varieties of fruits and vegetables.

[Horticulture at the Utah Station] (*Utah Sta. Bul. 235 (1932), pp. 62–70*).—The results are presented of studies on the development of chlorosis-resistant small fruits, on asexual propagation of fruit stocks, on the germination of sweet cherry seeds, on sweet cherry pollination, on tests of varieties of fruits, on the response of fruit trees to fertilizer and pruning, on such factors as topping and time of harvest on the keeping quality of onions, on the improvement of the Sweet Spanish onion, on factors underlying the formation of double onions and scallions, on the use of plant protectors and paper mulch in vegetable production, on the effect of cutting mother onion bulbs on resulting seed production, on the relative merits of seeding and transplanting onions, and on methods of plant production and use of plant growing structures.

An apparatus for spraying plants with melted paraffin or other waxes, T. J. Maney (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 496, 497, pl. 1*).—A brief description is presented.

The effect of paraffining, pruning, and other storage treatments upon the growth of roses and cherry trees, H. B. Tukey and K. Brase (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 489–495*).—Of several methods, including pruning and paraffining, trenching in sand, etc., of handling 2-year-old sweet cherry trees secured from five large nurseries and stored by the New York State Experiment Station in a modern concrete nursery cellar, none had any appreciable effect on subsequent survival. The source of stock did, however, have a profound influence, the losses being 0, 3, 7, 68, and 93 per cent, respectively, for the five lots.

In a subsequent experiment with sweet cherries and roses grown at the station, the various methods of handling in storage did have considerable differential effects. Paraffining the whole cherry tree was decidedly harmful, and paraffining the tops proved of no benefit with trees stored under approved nursery practice but did prove valuable with certain roses, which as a group proved more resistant to exposure than did cherries. Cherries on mazzard roots were more easily injured than those on mahaleb.

The use of washed sand as a substitute for soil in greenhouse culture, A. LAURIE (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 427–431*).—Using washed sand and chemicals applied in dry form, equally good results were obtained at Ohio State University with calendulas and various other flowering plants as when grown in soil. The generally favorable results led to the conclusion that sand cultures appear promising from the commercial viewpoint once the proper procedure has been worked out. From the scientific viewpoint sand culture offers an accurate method of approach in problems of plant nutrition.

Experiments with ultra-violet transmitting glasses for growing vegetable plants in coldframes, V. R. BOSWELL and A. M. JACKSON (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 375–379*).—Tests by the U. S. Department of Agriculture of three commercial glasses designed to promote growth of plants by the transmission of ultra-violet light failed to show any marked superiority or inferiority of these glasses to ordinary glass in the growing of tomato, pepper, and radish plants. In cases where there was any significant difference it was so slight and often so inconsistent from year to year as to be considered of little merit.

Forcing plants with artificial light, G. H. POESCH (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 402–406*).—Working with over 70 different kinds of plants to which was supplied 4 additional hours of light (6 to 10 p. m.), it was observed at Ohio State University that certain species were greatly benefited, while others, such as *Asparagus sprengeri*, narcissus, and hyacinths, were not affected. Freesias were decidedly retarded. Carnations given added light from November to April yielded 8.14 blossoms per plant as compared with 6.9 for the controls. Annuals sown September 25 in the greenhouse responded favorably to additional light, and good results were also secured with certain perennials placed in the greenhouse January 6.

In general, however, the slight increases in production were not sufficient to justify the cost of the electricity.

Sampling orchard soils for nitrate determinations, G. A. FILINGER (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 515–518, figs. 2*).—Records taken by the Kansas Experiment Station on samples of soil collected 20 different times during the period from March 26 to November 12 showed a very considerable fluctuation in the nitrates according to the date of sampling. This was especially true for samples taken in the top 6 in. of soil. Where samples were taken to a depth of 3 ft. the fluctuation was materially narrowed. The author suggests the need of taking samples at frequent intervals and at various depths in order to get a true picture of the behavior of nitrates in an orchard soil.

The effect of nitrate applications on the soluble carbohydrates in apples, E. F. HOPKINS and E. W. GREVE (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 501–506, figs. 2*).—Analyses made at repeated intervals during the growing season and subsequent storage period of apples taken from trees growing in sod and under cultivation again indicated (E. S. R., 65, p. 229) that the application of nitrogen fertilizer had little effect on the percentage of soluble carbohydrates in the fruit. In the case of sod-grown Stayman Winesaps, fruit from trees receiving the customary amount of nitrate of soda was higher in both reducing and total sugars than that from excessively nitrated trees. The variation in percentage of soluble sugars was greater in apples from the sod orchard than in those of the cultivated orchard. In the case of Wealthy apples harvested just prior to the usual picking season the percentage of total and reducing sugars was highest in the unfertilized group, but sucrose was higher in certain of the fertilized plats.

A survey of residua from phosphorus applications on orchard soils, R. M. Smock and J. H. Gourley (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 509–514, figs. 2*).—Determinations at the Ohio Experiment Station of the amount of available phosphorus at various depths in an orchard soil at Wooster in which fertilizers had been applied for several years showed very little downward diffusion. The maximum phosphorus was in the upper 2 in., with some indication of percolation to 6 in. In another orchard in which annual disking of alfalfa sod was practiced and in which the soil reaction was pH 6.9, phosphorus penetration was considerably deeper and better distributed. In an orchard where 14 years had elapsed without fertilizer application there was still a marked residue of phosphorus in the first inch of soil, accounted for in part by the extremely acid reaction (pH 4.3) and in part by the clayey nature of the soil.

Chlorosis of deciduous fruit trees due to a copper deficiency, F. G. Anderssen (*Jour. Pomol. and Hort. Sci., 10 (1932), No. 2, pp. 130–146, pls. 5*).—Describing a chlorotic condition of deciduous fruit trees growing in the western Cape Province of South Africa on a sandy, well drained soil of acid reaction, the author reports that applications of copper in the form of copper sulfate in amounts of from 0.25 to 2 lbs. per tree were successful in remedying the chlorosis. Treatments with potassium, magnesium, manganese, sulfur, iron, or manure had no effect. Analyses of plant materials showed a consistent deficiency of copper in the chlorotic tissue, which could be traced from leaf and fruit down to the 3-year-old bark and wood and thence to the roots. Ash content was always higher in the chlorotic tissues. Leaves dipped in very dilute solutions of copper sulfate turned green within 2 weeks. The function of copper in the physiology of plants is discussed.

Studies on maturity of fruit, I–III, J. C. Hinton (*Univ. Bristol, Agr. and Hort. Research Sta. Ann. Rpt., 1931, pp. 40–67, pls. 3, fig. 1*).—The subject is presented in three parts, the first of which, Introductory, discusses the literature and the present status of knowledge.

The second part, Preliminary Observations on the Rate of Softening of Apples, presents the results of studies at the Long Ashton station upon the differences in firmness, as recorded by the pressure tester, of apples grown under different conditions and picked at different stages of maturity. In the two varieties studied the rate of softening after picking was greater in late harvested fruits. Newton Wonder apples from ringed limbs softened more rapidly in the earlier pickings than did comparable fruit from nonringed branches. The difference between sod-grown and cultivated Newton Wonder apples were not sufficient to allow deductions, but in Grenadier, an early variety, it was apparent that fruits from the grass plats softened more slowly after picking. It is believed that ringed and grassed fruits were probably less mature at picking.

The third section, Starch Content in Relation to Maturity of Apples Grown under Various Orchard Conditions, deals with certain physiological changes occurring in stored apples of different varieties from various sources and different cultural treatments. The rate at which starch disappeared from apples during storage varied with the different samples and is considered a possible useful index to the rate at which ripening proceeds. A correlation between food supply favorable to the developing fruits and relative immaturity of the latter was noted in the majority of cases. Certain of the samples from thinning and ringing experiments were included in the minority, but potassium deficiency was also involved, complicating the situation. In general, fruit

grown under conditions of relatively favorable food supply ripened more slowly than comparable fruit which had a less favorable environment.

Further observations on the influence of position in the cluster on the quality of apples, J. C. Hinton, J. O. Jones, and F. C. Lewis (*Univ. Bristol, Agr. and Hort. Research Sta. Ann. Rpt., 1931, pp. 68–76*).—Continued work (E. S. R., 65, p. 638) at the Long Ashton station again showed marked differences in apples from different portions of the same cluster. Following thinning, lateral fruits of Allington Pippin and Bramley Seedling contained 50 per cent more sucrose at picking time than did corresponding terminal fruits, but in the case of Allington Pippin, lateral apples lost both sucrose and total weight more rapidly than did terminal fruits. No significant difference was observed in acid content of the two groups. Thinning to one fruit increased the concentration of sucrose in Bramley Seedling apples, equalized the sucrose content of lateral and terminal fruits, and resulted in a slightly higher concentration of acid in lateral than in terminal apples. The ash content of Bramley Seedling apples was similar, irrespective of position on the cluster or the thinning treatment.

The identification of red currant varieties, C. R. Thompson (*Univ. Bristol, Agr. and Hort. Research Sta. Ann. Rpt., 1931, pp. 28–39*).—In this contribution from the Long Ashton station red currants are classified into four major groups, (1) *Ribes rubrum*, (2) *R. vulgare*, (3) *R. vulgare macrocarpa*, and (4) Gondouin. The principal distinguishing features of each group are set forth, and comments are made on the outstanding characteristics of important varieties within the groups.

The influence of long pruning and thinning upon the quality of Concord grapes, N. L. Partridge (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 144–146; abs. in Michigan Sta. Quart. Bul., 15 (1932), No. 1, p. 45*).—At the Graham branch of the Michigan Experiment Station vines with 80–90 buds were handled as follows: (1) No treatment, (2) alternate buds rubbed off as growth started in the spring, (3) all clusters in excess of two per shoot removed, and (4) all clusters in excess of one per shoot removed.

Thinning reduced the total amount of fruit produced. Blossom thinning to one cluster per shoot or the removal of alternate buds at the beginning of growth reduced the production to about that of normally pruned vines (42–50 buds). Blossom thinning to two clusters per shoot did not reduce yields materially below no treatment. As determined by the Brix hydrometer, fruit of thinned vines contained a higher percentage of total solids. The lower the production the higher the solids in the juice. Blossom thinning tended to increase the weight of bunches and improve their appearance. Production of fruit tended to reduce shoot growth, but the increase in vigor due to long pruning, even with the excess clusters removed, was not great. Because of added labor costs long pruning with cluster thinning of the Concord is not considered economically advisable.

The effect of fruit production and fertilizer treatments on the maturity of Concord grapes, N. L. Partridge (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 147–150; abs. in Michigan Sta. Quart. Bul., 15 (1932), No. 1, p. 45*).—In this study the percentage of total solids in the juice of Concord grapes tended to be lower as production was increased. When data from all growth classes were averaged the weaker vines produced fruit with a larger percentage of total solids, due apparently to the fact that the production of weaker vines tended to be less in total weight and hence a higher average.

Whereas in 1926 no effect of fertilizers on the percentage of total solids was apparent, comparisons in 1927 between vines of approximately equal pro-

duction did show consistently higher percentages of total solids in the fruit of the unfertilized vines. Lime added to nitrogen apparently further depressed the percentage of total solids. Phosphorus on the other hand when used with nitrogen had little effect, while potash seemed to increase the percentage of total solids slightly. The author does not believe that the data show positively the advantage of any fertilizer treatment in hastening maturity or influencing the percentage of total solids in the juice.

Stomatal apparatus of the cultivated cranberry Vaccinium macrocarpon, W. H. Sawyer, jr. (*Amer. Jour. Bot., 19 (1932), No. 6, pp. 508–513, pl. 1*).—In this study at the East Wareham Cranberry Substation of the Massachusetts Experiment Station upon the leaves of four varieties, Early Black, Pride, McFarlin, and Howes, there was found no varietal difference of taxonomic or functional significance in the stomatal apparatus. In the old leaves the stomatal count was lower in McFarlin than in the other three varieties. Stomata were found only on the under sides of the leaves. No chloroplasts were found within the guard cells but were present in other epidermal cells on both sides of the leaves. As a whole the stomatal apparatus was found poorly adjusted in function to changing environmental factors of light, temperature, and water.

Coloring citrus fruit ([*Los Angeles*]*: Calif. Fruit Growers Exch., 1932, pp. 82, figs. 52*).—The results are presented of extensive studies conducted by the California Fruit Growers Exchange of methods and of comparative merits of coloring citrus fruits with ethylene gas and the by-product gases of incomplete combustion of kerosene. One of the chief difficulties encountered in commercial coloring rooms was the inability to maintain uniform temperatures, which could be secured only by the use of forced air circulation. From the standpoint of rate of coloring and of ease of control the ethylene treatment was found superior to the kerosene. Hot weather in summer resulting in temperature of the fruits greatly above the optimum seriously interfered with the coloring of Valencia oranges.

Physiological factors associated with the productiveness of pecan shoots, A. H. Finch and H. L. Crane (*Natl. Pecan Assoc. Proc., 30 (1931), pp. 98–107, figs. 2*).—As determined by the U. S. Department of Agriculture at Albany, Ga., weak fruiting shoots on weak trees set 27.9 per cent of their blossoms as compared with 40 per cent for weak shoots on vigorous trees. The difference between strong shoots on the two types of trees was not marked. Dropping continued some 10 days longer on weak than on vigorous trees. Records taken of the dry weight of nuts harvested June 18 showed those from weak shoots to be materially lighter in weight in both weak and vigorous trees. Observations on the relation of size of buds to the behavior of shoots arising therefrom showed that large buds tend to produce not only a higher percentage of blossoming shoots but also stronger ones which retain their nuts to a higher degree. Strong fruiting shoots tended to produce regularly and repeatedly. The strong shoots which bloomed heaviest set the greatest percentage of nuts, formed the largest buds for next season's growth, and started growing earlier and more rapidly than weak shoots in the same trees.

Microchemical examination of shoots showed that starch is present in all of the preceding season's shoots in early spring, but disappears shortly to reappear again about the middle of June. About the middle of July starch accumulated rapidly in all shoots, with pronounced appearance in the tips of strong fruiting shoots. An abundance of free sugars, probably glucose, was noted in the nut cluster stems of both strong and weak shoots and also in the liquid contained in the young kernels, suggesting the possibility that the processes fundamental to the filling of nuts may take place in early summer.

A preliminary report on the relation of foliage to filling of the pecan, B. G. SITTON (*Natl. Pecan Assoc. Proc., 30 (1931), pp. 120–125, fig. 1*).—At Shreveport, La., starting in early August soon after the shells had begun to harden but before any considerable filling had taken place, ringed shoots of Stuart and Schley were thinned to 1, 2, 4, 6, 8, and 10 compound leaves per nut. An examination of the nuts at harvest showed the greatest kernel development in both varieties with 10 leaves. In order to produce nuts of No. 1 grade, it was necessary to leave 4 or more leaves for Schley and 6 or more for Stuart. On the basis of net weight of kernels produced by a definite number of leaves, Schley foliage was more efficient than Stuart.

Some factors affecting the premature dropping of pecans, H. L. CRANE (*Natl. Pecan Assoc. Proc., 30 (1931), pp. 92–97*).—Records taken by the U. S. Department of Agriculture at Albany, Ga., showed that short and weak pecan shoots produce blossoming shoots which set and mature only a small percentage of nuts. There was a very marked relation between the length of shoot of one season and the percentage of blossom clusters which set nuts the next year.

In another experiment where three complete fertilizers, 3–8–3, 5–8–3, and 8–8–3 (N–P–K), were compared, the yields were proportionate to the nitrogen content of the fertilizers. Data taken in 1931 showed that 49.1 and 63.4 per cent of the pistillate blooms set, respectively, on the 3–8–3 and 8–8–3 plats. The number of shoots which bloomed and set nuts was increased 22 per cent by the larger application of nitrogen, the odds being 446 : 1. From these data the author concludes that nitrogen has an important effect on nut setting in the pecan. Water deficiency brought about by planting on very sandy or dense clay soils contributed to premature dropping in adverse seasons, and suggests the advisability of removing part of the trees in unfavorably located orchards.

Fertilizing the pecan, J. J. SKINNER and A. O. ALBEN (*Natl. Pecan Assoc. Proc., 30 (1931), pp. 26–29*).—A total of 9,500 lbs. of Austrian pea vines were harvested per acre following the application of 100 lbs. of muriate of potash, 150 lbs. of superphosphate, and 200 lbs. of lime to a fine sandy loam in Sabine Parish, La., as compared with 455 lbs. per acre on the nonfertilized area. The importance of phosphorus was shown in yields of 3,400 lbs. of vines on soil receiving 150 lbs. of 18 per cent superphosphate.

The growth of several floricultural crops on limed and acidified soils, F. F. WEINARD and S. W. DECKER (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 416, 417*).—Observations at the University of Illinois on the growth and flowering of plants in soil with pH values of 5 to 5.5 and 7 to 7.5 indicated that most flower crops grow and produce satisfactorily within the soil reaction range utilized. Blue Bird forget-me-nots began to bloom about 10 days earlier in the acid soils.

Vegetative growth and flower production of summer annuals when grown under cheese cloth, K. POST (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp 393–397*).—Results obtained in a cloth-covered house 32 by 48 ft. used at Cornell University for growing various summer annuals, such as asters and calendulas, indicated that such a structure has commercial possibilities. Several species grew finer blossoms under the cloth than in the open. Calendulas, Trachymene, and dahlias were particularly benefited, while certain species, such as zinnia and Tagetes, were inclined to be soft stemmed and fragile. Asters suffered less from wilt, and insects in general were reduced under the cloth.

Reducing the day length of chrysanthemums for the production of early blooms by the use of black sateen cloth, K. POST (*Amer. Soc. Hort.*

Sci. Proc., 28 (1931), pp. 382–388).—A reduction at Cornell University of the photoperiod of chrysanthemums by the use of black cloth advanced the time of bloom from 39 to 57 days, according to variety. Darkening for 2 hours at both ends of the day was more effective in hastening bloom than was 4 consecutive hours either morning or evening. Comparing 10, 20, and 30 days of darkening, it was evident that the shorter period may be equally as effective as when continued up to the time of bloom. Stems of flowers forced into bloom earlier than normal were shorter than those of plants having the usual photoperiod. Darkening the entire plant was more effective than merely darkening the flower buds.

Studies of photoperiodism of the crysanthemum, G. H. Poesch (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 389–392).*—In these studies at Ohio State University, covering plants with entire white shade had no effect in hastening blossoming. The duration of the light rather than the intensity was found to be the controlling factor in influencing time of bloom, since under lath frames there was no effect. The application of nitrogen or potash did not influence the time of blooming.

Microchemical tests of the tip, midsection, and base of the stems of plants from the several treatments showed very large amounts of nitrates in all tissues of nitrogen-supplied plants, abundant nitrates in the potassium-supplied plants, and as a matter of fact in plants of all treatments, including the unshaded and unfertilized. No starch was found in the stems of shaded plants, and it was highest in the unshaded, unfertilized group.

The effect on gladioli of heating the soil with electricity, S. L. Emsweller and J. R. Tavernetti (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 398–401, pl. 1, fig. 1).*—The use at the University of California of a special soil-heating wire placed at a depth of 5 in. midway between rows of gladiolus hastened growth and blooming. Prince of Wales flowers commenced blooming April 22, and 90 per cent of the flowers were in bloom when the first ones opened in the check rows, May 8. A considerable increase in the weight of new corms and cormels was recorded in favor of the heated area. There was no appreciable difference in quality of blooms between the two plats.

Peony fertilizers and cutting methods, S. W. Decker and F. F. Weinard (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 423–426, figs. 2).*—Experiments at the University of Illinois indicated that the peony when planted in fertile soil does not respond profitably to application of fertilizers. The effects of different degrees of severity of cutting were compared (on seven varieties) with the observation that cutting reduced moderately the subsequent production. A larger number of blooms were harvested from plants from which all shoots were cut than those from which only one-half the shoots were removed, but the stems were shorter. There were no marked differences in vigor between the two plats, and cutting did not increase the susceptibility of plants to disease.

Summer flowering phloxes, A. M. S. Pridham (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 418–422).*—Tracing the history of the development of the cultivated phlox, the author lists early American varieties, with the originator, date of origin, and color of bloom.

Effects of temperature and desiccation during storage on germination of seeds of the American elm (Ulmus americana L.), C. E. and G. P. Steinbauer (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 441–443).*—The length of the rest period of elm seeds was found in these studies at the University of Minnesota to be influenced both by moisture content and by storage temperature. In general, the rest period was shorter at 0° than at 10° C., irrespective

of moisture content. The rest period of elm seeds began a few weeks after harvest and terminated approximately 6 months later. The period of high viability lasted for about 3 months after the break of the rest period. In general, the drier the seed the higher the percentage of germination at any time and the longer the period of viability.

Effects of the application of nutrients to ornamental trees. A. F. De Werth and L. C. Chadwick (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 432–434*).—Using as plant material established young trees of the English elm and sugar maple, favorable responses were secured at Ohio State University from the application of quickly available nitrogen fertilizers. In the elm both nitrate of soda and ammonium sulfate increased twig length increment about nine times that of check trees. In the maple the trees on the nitrogen plats made from 15 to 20 times the growth increment of the check plats. Superphosphate alone gave very little increase above the checks, due apparently to its slow soil penetration. Complete fertilizer gave favorable results. In general spring applications were more beneficial than autumn.

Growth experiments with shade trees under lawn conditions, D. Wyman (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 435–440*).—At Cornell University 5-year-old pin oak trees planted in the spring made significantly better growth than those set in the autumn. Furthermore, the percentage of killed and badly injured trees was considerably greater in the fall-planted group. In a stony clay soil, planting with care in deep, wide holes gave worth while results but had no significance in a silty clay loam. Nitrogen fertilizer used in the hole at planting had no beneficial effect and in some cases apparently caused leaf injury. Pruning was beneficial in the case of spring-planted trees.

Some comparisons of methods of grafting evergreens, V. T. Stoutemyer (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 498–500, pls. 2*).—At the Iowa State College dipping the entire scion in melted paraffin (165° F.) and then brushing the union with the same material resulted, in the case of plants set in open greenhouse benches, in 86 per cent of success as compared with 70 per cent for wrapped grafts and 52 per cent for paraffined grafts in a standard propagating case.

A study of the regions of the tomato fruit as affected by selection, E. C. Stair and J. H. MacGillivray (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 350–352*).—Studies at the Indiana Experiment Station upon fully ripe tomatoes, harvested from plants of John Baer and Indiana Baltimore which had been grown from seed of fruits selected for high or low percentage of wall material, showed no progressive change in wall material as a result of selection. Where selection was made on the basis of the refractive index of the expressed juice the results were much the same as with wall material, that is, the averages returned in the direction of the mean. No correlation, either positive or negative, could be established between a larger percentage of wall tissue and a higher concentration of the fruit juice.

Greenhouse tomato variety tests, H. L. Seaton (*Michigan Sta. Quart. Bul., 15 (1932), No. 1, pp. 8–16, figs. 2*).—Accompanied by descriptions, tabulated data are presented on the yields by months for nine varieties of forcing tomatoes grown in the spring of 1931.

The Pritchard tomato, W. S. Porte (*U. S. Dept. Agr. Circ. 243 (1932), pp. 4, fig. 1*).—This new variety, developed from a cross of Cooper Special × Marglobe, is carefully described and briefly discussed in relation to time of ripening, resistance to diseases, including Fusarium wilt and nailhead rust, and as to uses.

The various effects of frost protectors on tomato plants, R. P. Hibbard (*Michigan Sta. Tech. Bul. 124 (1932), pp. 36, figs. 8*).—Many different grades and kinds of plant protectors were studied over a period of six years during which there occurred a wide variety of climatic conditions. Both the air and the soil beneath most of the covers warmed up more rapidly than in the open, and the covers provided protection from cutworms and in some cases obviated the necessity of weeding. Growth under the protectors was generally better than in the open, but two or three weeks after their removal the distinction between the two groups of plants was often difficult. Partial etiolation resulting in some cases from covering also disappeared shortly after the plants were uncovered. Under certain covers growth was not checked at all, while under others light was apparently a temporary limiting factor.

From a practical standpoint the protectors were of undoubted value in one of six years, of doubtful value in two, and of no value in three. In years when the protection was beneficial there was some increase in yield, both early and total. Glassine and glassine-like covers more frequently hastened ripening, stimulated yields when prices were high, and lost less fruit by frost at the end of the season than did any other type of protector.

Tomato color as affected by processing temperatures, J. H. MacGillivray (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 353–358, figs. 4*).—Observations at the Indiana Experiment Station upon the color changes in canned tomatoes processed in water at 70, 80, 90, and 100° C. showed the least loss in color at the lowest temperature. Observations on other lots processed at the above temperatures showed practically no spoilage, just one can from the 80° lot. Similar experiments with tomato juice showed the same impairment of color at high temperatures. Bubbling pure oxygen through tomato juice resulted in decidedly poorer color at all temperatures than did the bubbling of pure nitrogen or no treatment. Subjection of tomato juices of different color ratings to like temperatures indicated that good colored juices suffer a relatively greater color impairment than do poorly colored samples. It was apparent that oxidation of tomato pigment results in color reduction, and that high temperatures have a similar although independent effect.

Effect of size of crown and length of cutting season on yields of asparagus, E. S. Haber (*Jour. Agr. Research [U. S.], 45 (1932), No. 2, pp. 101–109; abs. in Amer. Soc. Hort. Sci. Proc., 28 (1931), p. 309*).—Records taken at the Iowa Experiment Station over a 3-year period on the yield of 150 asparagus plants set out when 1 year old after individual weighing showed marked variability. Male plants produced a greater number of spears and heavier yields per plant than did the females. The average weight of male plants was slightly greater at planting, but had all crowns below 15 g in weight been discarded more of the males than females would have been lost. The total weight of spears produced by any one plant in any season was highly correlated with the total weight of spears produced in each of the other two years. In males for all three years total yield or total weight of spears was significantly correlated with weight of crown at planting. With females this correlation was negative but significantly so in only one season. When males and females were combined no significant correlation was found.

As concerned the length of cutting season, no subsequent harm and greater yields resulted from cutting up to July 1. Plants cut to July 15 showed a significant decrease in yield the following year, and it is deemed possible as the plantation grows older that even July 1 may be too late for best results.

Some chemical and physical changes observed in green Lima beans subjected to various storage conditions, R. L. Carolus (*Amer. Soc. Hort.*

Sci. Proc., 28 (1931), pp. 367–374).—At the Virginia Truck Experiment Station, Henderson bush Lima beans harvested at intervals from September 10 to October 20 and stored under various temperature and humidity conditions were studied with respect to physical and chemical changes. The greatest loss in weight of beans, whether in pods or shelled, occurred the second and third days after picking. However, the percentage of whitened beans was largest the first day. Cellophane was effective in preventing moisture losses but did not check whitening and tended to promote toughness and deterioration in quality.

Chemical changes included a rapid loss in total sugars, especially during the first 24 hours. A slight increase in starch during the first 24 hours was explained on the basis of sugar condensation. Total and insoluble nitrogen tended to increase and soluble nitrogen to decrease during the storage period. Little change was recorded in actual amount of fiber throughout the storage period. The author concludes that Lima beans are physiologically older than other vegetables used in the green state.

The successful pollination period of garden beets, Beta vulgaris, R. Magruder (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 332–335*).—Briefly discussing pollination technic employed with the beet, the author asserts that emasculation and removal of lateral flowers is difficult to accomplish without causing serious injury. In every case materially better sets of seed were secured from the unemasculated blooms.

Pollination trials in the greenhouse at Cornell University made at different stages of floral development indicated that the day of anther dehiscence is best, and that pollination could not be delayed longer than the first day after opening.

Similar tests carried on in the field at the Ohio Experiment Station suggested that the period of receptivity may last 2 and perhaps 3 days in the open. Some indication was seen that pollination from 4 to 7 hours after dehiscence favors fertilization.

The influence of inbreeding upon the season of maturity in cabbage, O. H. Pearson (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 359–366*).—Comparisons at the California Experiment Station of inbred lines of Copenhagen Market cabbage with hybrids between such lines with respect to earliness and plant weight indicated that crossing of unrelated lines tends to increase earliness, sometimes as much as a week. Hybrids between related lines usually had the same season as their parents. With respect to total plant weight, some crosses yielded progeny of greater weight than the parents, indicative of heterosis. Generally the variations in total weight were in the same order as those for earliness, but in one cross the season of the hybrids remained the same as that of the parents, whereas the total plant weight was considerably higher.

The author concludes that season in cabbage is dependent in part on genetic factors, and that hybridization with resulting increased vigor is not necessarily associated with earlier maturity.

Manurial experiments with hops in pot culture, F. H. Beard (*Jour. Pomol. and Hort. Sci., 10 (1932), No. 2, pp. 91–105, pls. 3*).—Of various fertilizer treatments applied to hops, those in which nitrogen or phosphorus was omitted had the most pronounced effects, these plants being stunted, developing few shoots, and tending to become entirely unfruitful. In the case of nitrogen deficiency the leaves were pale green and in the absence of sufficient phosphorus were dull green. Potassium on the other hand tended to stimulate growth and to lengthen the growing period. The leaves, however, showed marginal scorch, slight

chlorosis, and purpling, these manifestations increasing with an increase in the nitrogen supply. The omission of calcium caused no marked effect except some marginal scorching of the lower leaves. A lack of magnesium caused angular spotting and scorching of the leaves, premature leaf abscission, and failure of cones to develop. Rain water was indistinguishable in its effects from the no-nitrogen treatment.

The peppers, A. T. Erwin (*Iowa Sta. Bul. 293 (1932), pp. 117–152, figs. 11*).—A monograph on cultivated peppers in which are discussed origin, botanical characters and relationships, the classification of varieties, culture, yields, uses, and diseases, the last by C. S. Reddy of the plant pathology section.

FORESTRY

The Yale Demonstration and Research Forest near Keene, New Hampshire, J. W. Toumey (*Yale Univ. School Forestry Bul. 33 (1932), pp. X+106, pls. 36*).—A general description is presented of the forest and experimental plats, manner of operation, rates of growth of various species, products and utilization, returns, etc. Volume, yield, and financial return tables are appended.

Some observations on Pinus virginiana Mill. in Monroe County, Indiana: An ecological study, J. E. Potzger (*Ind. Acad. Sci. Proc., 47 (1931), pp. 153–174, figs. 9*).—As established in studies by Indiana University, *P. virginiana* was spreading rapidly in Monroe County as an escape from isolated cultivated trees. Its prolific reproduction in open areas and on worn out soil makes the species desirable for reforesting waste and barren land. This pine displayed an extreme intolerance to shade, with practically no reproduction under parent trees possessing dense crowns.

The seed development in Pinus palustris, A. C. Mathews (*Jour. Elisha Mitchell Sci. Soc., 48 (1932), No. 1, pp. 101–118, pls. 7*).—The results are presented of a microscopical study at the University of North Carolina of the processes of pollen and ovule formation and fertilization in the longleaf pine.

Planting experiments with ponderosa pine in northern Minnesota, T. Schantz-Hansen (*Jour. Forestry, 30 (1932), No. 6, pp. 680, 681*).—Low survival at the close of ten years accompanied by a poor growth of the remaining trees led to the conclusion that ponderosa pine is not suitable for planting in northern Minnesota.

Seed release from western white pine and ponderosa pine cones, D. S. Olson (*Jour. Forestry, 30 (1932), No. 6, pp. 748, 749*).—Covering attached freshly ripened cones of both species with light wire screen cages, the author found that the principal release of seed took place in the spring. A high proportion of the early-released seeds was empty.

Chemical treatments to shorten the rest period of red and black oak acorns, C. G. Deuber (*Jour. Forestry, 30 (1932), No. 6, pp. 674–679, fig. 1*).—Germination records taken at Yale University on acorns of two species, collected in October and part immersed in a 3 per cent solution of thiourea and part exposed to the vapors of ethylene chlorohydrin for 24, 48, and 96 hours, showed a definite acceleration from all ethylene treatments, while thiourea for a time delayed germination as compared with the controls. Both chemical treatments accelerated the rate of germination for a short period, and of the two chemicals thiourea is believed to hold more promise because it stimulated more acorns to germinate within a short period than did the ethylene chlorohydrin.

Planted hardwoods differ in rate of growth, D. J. WEDDELL (*Michigan Sta. Quart. Bul., 15 (1932), No. 1, pp. 35, 36*).—Measurements in a plantation of hardwoods established in the Michigan State College nursery in the spring of 1907 showed basswood, red oak, chestnut, black cherry, white ash, and green ash in descending order of average diameter growth. Red oak led in height growth and black cherry in percentage of survival. As a result of these tests the two ash species are said to be of little value for planting on dry sites.

A precision dendrometer, L. H. REINEKE (*Jour. Forestry, 30 (1932), No. 6, pp. 692–699, figs. 8*).—A simple, accurate, nonrecording dendrometer consisting of a screw hook imbedded in the wood is described and its operation discussed. As growth proceeds the bark is pushed outward, making it necessary simply to measure the diminishing distance between the end of the hook and the bark.

Selection cuttings for the small forest owner, R. C. HAWLEY and A. W. GOODSPEED (*Yale Univ. School Forestry Bul. 35 (1932), pp. 34, pls. 3, fig. 1*).—Designed primarily to aid owners in the development of a profitable plan for managing their small forest areas, this paper discusses selection cutting as compared with clear cutting and outlines a practical system of management based on the selective system.

Seasonal shrinkage of Monterey pine and redwood trees, F. W. HAASIS (*Plant Physiol., 7 (1932), No. 2, pp. 285–295, figs. 4*).—A study of dendrographic records made in Monterey County, Calif., indicated that fall or winter swelling in trees is preceded by a progressive contraction during the dry period of summer. Such shrinkage apparently may occur also during an unusually dry spring. Both the Monterey pine and the redwood were found to undergo these seasonal variations, the most important underlying cause of which was apparently soil moisture changes. In a single tree the heartwood may be shrinking while the tree as a whole is swelling.

The strength and related properties of redwood, R. F. LUXFORD and L. J. MARKWARDT (*U. S. Dept. Agr., Tech. Bul. 305 (1932), pp. 48, pls. 6, figs. 21*).—Studies conducted by the U. S. D. A. Forest Products Laboratory in cooperation with the University of Wisconsin are reported, the purpose of which was to obtain information on the physical and mechanical properties of redwood. The studies included a specific gravity survey and the determination of strength and related properties.

It was found that the redwood studied was higher in such properties as bending strength, crushing strength, and hardness than would be expected from its specific gravity, while in shock resistance it was usually somewhat lower. Redwood in the form of small specimens increased in strength in drying, although the relative increase was less than for most species. A few properties, particularly those indicative of shock-resisting ability, frequently showed a decrease due to drying. The virgin-growth redwood from Mendocino County, Calif., was somewhat stronger than that from Humboldt County, but the differences in most strength properties were not so great as would be expected from the differences in weight. The strongest virgin-growth redwood, all properties considered, came from just above the butt log.

The moisture in the heartwood of the virgin-growth redwood studied varied from an average of about 140 to 175 per cent at the stump of individual trees to about 60 per cent at midheight, beyond which point it remained almost uniform throughout the rest of the tree. The moisture in the sapwood averaged over 200 per cent throughout the entire height of the tree.

The extractives in the wood affected the strength of the redwood studied, increasing such properties as bending strength and compressive strength, while shock resistance under some conditions was actually decreased.

The shrinkage across the grain of the heartwood of the redwood studied was relatively low. The low shrinkage appeared to be due primarily to the extractives in the heartwood, as the sapwood, which had a lower extractive content, was considerably higher in shrinkage. Occasional pieces of redwood, like those of other softwood species, contained compression wood in varying degrees. Compression wood has a much higher endwise shrinkage than normal wood and is also deficient in strength for its weight, and therefore boards containing much of it should be discarded for most lumber uses.

An appendix contains detailed data from the specific gravity survey, detailed data on strength and associated properties of redwood, and an explanation of terms and methods employed. A list of 14 references to literature bearing on the subject is included.

DISEASES OF PLANTS

Effect of solid and gaseous carbon dioxide upon transit diseases of certain fruits and vegetables, C. Brooks, E. V. Miller, C. O. Bratley, J. S. Cooley, P. V. Mook, and H. B. Johnson (*U. S. Dept. Agr., Tech. Bul. 318 (1932), pp. 60, figs. 34*).—Studies were made in the laboratory at constant temperatures and with constant percentages of carbon dioxide, and in pony refrigerators and refrigerator cars, in which the temperature and percentage of carbon dioxide were continually falling, to determine the effect of a short period of gas storage as a possible substitute for precooling in order to decrease the spoilage in fruits and vegetables that often occurs during the first day or so after loading warm products into refrigerator cars. The control of diseases and other forms of spoilage was readily accomplished, but the effect of carbon dioxide upon the flavor of the product was found to set a definite limitation to this method of treatment.

The most serious limitation was found with peaches, apricots, strawberries, and red raspberries. Plums, cherries, blackberries, blueberries, black raspberries, currants, pears, apples, and oranges showed a greater tolerance of the gas. Grapes, peas, sweet corn, and carrots stood extreme treatments with favorable results.

The first objectionable effect from excessive carbon dioxide treatments was a slight loss of aroma. With more prolonged or severe treatments, this was followed by a still greater loss of flavor and sometimes by the development of an odor of fermentation or other objectionable quality. High percentages of carbon dioxide were more harmful than lower ones, yet with 25 per cent or more of the gas increased concentration did not greatly shorten the period of safe treatment. The effect of the carbon dioxide upon the flavor increased with an increase in temperature in a manner that indicated a relationship with general metabolic activities.

With strawberries at temperatures ranging from 32 to 77° F., Botrytis and Rhizopus rots were fairly well inhibited by 23 per cent of carbon dioxide, and completely inhibited by 37 per cent or more of the gas. Botrytis inoculations on Bartlett pears and Monilia inoculations on Italian prunes were held in check by from 20 to 30 per cent of carbon dioxide and greatly inhibited by from 12 to 15 per cent. Experiments with Monilia inoculations on peaches showed that within the range of from 10 to 50 per cent of carbon dioxide the average reduction in efficiency of the fungus was approximately twice that of the percentage of gas used. At 77°, within a range of from 10 to 40 per cent, the carbon dioxide had an effect upon Monilia rot approximately equivalent to that of reducing the temperature as many degrees as the percentage of gas used.

Carbon dioxide was more efficient in checking the softening of the fruit than in preventing the development of soft rots. With 25 per cent or more of the gas the softening of strawberries was almost completely inhibited, and the softening of warm peaches was as greatly checked as by a drop in temperature of 18° or more. In pony refrigerator experiments, Bartlett pears and three varieties of apples were held as firm and as free from disease by initial carbon dioxide treatments as by immediate storage at 32°. Carbon dioxide treatments proved valuable in preventing the shattering of grapes. Sweet corn, cauliflower, peaches, and carrots that had been exposed to the gas were found to be distinctly sweeter than those held in normal air at the same temperature.

Fourteen refrigerator car experiments are reported upon in which solid carbon dioxide was used as a supplementary refrigerant and as a source of carbon dioxide gas. Four of these were with strawberries, 5 with peaches, and 5 with dewberries. The carbon dioxide treatments had no objectionable effect upon the flavor, except that in two peach shipments that received the maximum treatment a slight change in flavor was detected when the fruit was held till fully ripened. The carbon dioxide treatments had an average effect upon the rots in the top of the car equivalent to a lowering of 10° in temperature throughout the trip, or to an average lowering of temperature of 21° during the first 36 hours. The fruit in the top of the test cars showed greater firmness at destination than the fruit at the bottom of the control cars, despite the fact that the temperature in the bottom of the control cars averaged about 13° lower than the temperature in the top of the same cars.

Under the conditions of the shipping experiments reported, the inhibiting effect of the solid carbon dioxide was found to be almost entirely due to the carbon dioxide gas, the refrigerating effect of the solid carbon dioxide being largely offset by a slower melting of the ice in the bunkers.

The effect of mosaic on cell structure and chloroplasts, M. T. Cook (*Jour. Dept. Agr. Puerto Rico, 15 (1931), No. 2, pp. 177–181, pls. 5*).—Two points to which the author has called attention in his work previously noted (E. S. R., 67, p. 137), namely, that mosaic inhibits the development of the meristematic tissue so that little if any differentiation occurs after the virus comes in contact with it, and that for a time the development of chloroplasts is inhibited, have been confirmed in the author's work, here reported in detail as followed in 1930 in studies with mosaic plants of *Crotalaria striata, Carica papaya,* and *Eucharis amazonica.*

A virus disease of delphinium and tobacco, W. D. Valleau (*Kentucky Sta. Bul. 327 (1932), pp. 81–88, figs. 4*).—A virus disease of perennial delphinium is described, the symptoms of which are said to bear some resemblance to tobacco ring spot, although the disease is caused by a distinct virus. The virus was found to transfer readily to tobacco and is considered to be identical with a virus sometimes found in White Burley tobacco. The delphinium virus was found to affect plants in the families Ranunculaceae, Solanaceae, and Cucurbitaceae. It is thought possible that the virus may be seed borne.

[Plant disease investigations at the Tennessee Station] (*Tennessee Sta. Rpt. 1931, pp. 34, 48, 49, 50–54*).—Notes are given of investigations by G. A. Shuey on the inefficiency of a copper fluorine compound for the control of yellow leaf of cherries; by B. D. Drain on fire blight and the root knot nematode; and by C. D. Sherbakoff on wheat scab and root rot, on spraying experiments with apples, cherries, and peaches, on tobacco diseases, and on cotton wilt.

Botany and plant pathology (*Utah Sta. Bul. 235 (1932), pp. 49–54*).—Among the studies reported upon are bacterial canker, curly top, and psyllid

yellows of tomato; psyllid disease of potatoes; nature, cause, and methods of controlling chlorosis; wheat bunt; and bacterial wilt of alfalfa.

Studies on grain rusts [trans. title], M. MENCACCI (*Bol. R. Staz. Patol. Veg. [Roma], n. ser., 9 (1929), No. 3, pp. 305–320*).—The first section of this work dealt prominently with the retention of germinative power by the uredospore; the second with the influence of the time of seeding on grain rust in the field.

Factors affecting the development of the aecial stage of Puccinia graminis, R. U. COTTER (*U. S. Dept. Agr., Tech. Bul. 314 (1932), pp. 38, pls. 5*).—An account is given of a study, made in cooperation with the Minnesota Experiment Station, of the factors affecting the development of the aecial stage of *P. graminis.*

A list is given of susceptible and immune species and varieties of Berberis as determined by the author and others. In a cross between the common and Japanese barberry, individual plants were found showing correlation between the morphological characters of *B. vulgaris* and susceptibility to *P. graminis.*

Teliospores of *P. graminis* were found to retain their viability for at least one year and a half when kept dry and at a temperature near the freezing point. Teliospores rarely germinated and produced sporidia at temperatures higher than 26° C. Temperatures ranging from 12 to 21° were found most favorable for germination of teliospores, barberry infection, and production of aecia. Freezing killed the host plant before the rust was destroyed. Light and moisture had no effect on the production of aecia and pycnia, but the absence of light appeared to prolong the susceptibility of the host because of the tissues remaining succulent.

Barberries became infected when exposed to teliospores that had been wetted for 11 days. The minimum time required for barberry infection by teliospores was 21 hours. Infection by sporidia took place after 5 hours' exposure in a moist chamber. Leaves, stems, spines, petioles, sepals, and berries of *B. vulgaris* were found to be susceptible to infection, and leaves became infected when 16 days old.

Aeciospores were discharged for 37 days after the appearance of aecia, and they infected rye plants 46 days after the appearance of aecia on barberries.

Two physiologic forms of *P. graminis tritici* were isolated in cultures from a single aecial cup. The telia used to inoculate barberries were found to contain 9 or more physiologic forms.

Some aspects of the spread of stem rust, G. L. PELTIER (*Zentbl. Bakt. [etc.], 2. Abt., 78 (1929), No. 24–26, pp. 525–535*).—This paper was presented at the tenth annual meeting of the leaders in barberry eradication.

Evidence is reviewed to the effect that there is a source of primary infection other than the local barberries in Nebraska. This is supposed to originate in overwintering urediniospores in southern Texas. "Some of the urediniospores prevalent in northern Texas and intervening States during May reach Nebraska, and are responsible for the widely scattered primary infection not directly traceable to barberries found in this State."

Wheat mosaic [trans. title], J. DUFRENOY (*Bol. R. Staz. Patol. Veg. [Roma], n. ser., 9 (1929), No. 3, pp. 298–304, figs. 2*).—The author describes wheat mosaic as to the general symptoms, the cell inclusions, the so-called figures of plasmolysis, the comparable effect of cold on healthy wheat, and the characters common to wheat rosette and court-noué of the grapevine.

To render infected a healthy soil it is necessary to incorporate intimately at least 10 per cent of soil from an infected vineyard. An infected soil may be disinfected by heating to 120° C. (248° F.).

Bean diseases and their control, L. L. Harter and W. J. Zaumeyer (*U. S. Dept. Agr., Farmers' Bul. 1692 (1932), pp. [2]+28, figs. 14*).—Popular descriptions are given, together with suggestions for the control of the principal diseases of garden, field, and Lima beans, including those of garden and Lima beans found to occur in transit.

Alternariose or black rot of carrot [trans. title], P. Scaramella (*Bol. R. Staz. Patol. Veg. [Roma], n. ser., 9 (1929), No. 2, pp. 226–237, figs. 6*).—The author describes, as studied in 1928, a disease of carrot said to correspond to that described in America under the name black rot and with the same causal organism, *Alternaria radicina*, by Meier, Drechsler, and Eddy (E. S. R., 51, p. 151). The mycelium of *A. radicina* is believed by the present author, as by Lauritzen (E. S. R., 56, p. 545), to live saprophytically in the soil.

Downy mildew of cucumbers, W. L. Doran (*Massachusetts Sta. Bul. 283 (1932), pp. 22*).—A report is given of investigations of the downy mildew caused by *Peronoplasmopara cubensis* on the source of primary infection, the effect of climatic factors on the disease and on the fungus which causes it, and on the prevention of infection by the use of fungicides.

Laboratory experiments showed that sulfur was more efficient than copper-lime dust in preventing sporulation of the fungus, and conidia were killed by contact with dry sulfur for five hours at 22° C. Sulfur was, however, not toxic to the conidia in water, and infection was not prevented when the conidia in water fell upon leaves dusted with sulfur. In the field, not only did sulfur fail to provide protection but it was definitely injurious to cucumber plants.

For control of downy mildew, both in the field and in the greenhouse, copper fungicides are recommended.

Yields of cucumbers were increased more if copper-lime dust was first applied before, rather than after, infection. Later applications should be made at weekly intervals. Bordeaux mixture 3–3–50 was found a sufficient concentration for use in the field, and a 1–1–50 Bordeaux mixture is suggested for use in greenhouses.

Fusarium solani in symbiosis with bacteria in the determination of a wet canker of potato tuber [trans. title], F. Sansone (*Bol. R. Staz. Patol. Veg. [Roma], n. ser., 9 (1929), No. 2, pp. 170–213, figs. 21*).—A wet canker of potato tuber, as studied, constitutes of itself a definite disorder independently of attack by Phytophthora. The wet canker is due to the symbiotic interaction of *F. solani* with a schizomycete said to live within the conidia and hyphae of the Fusarium. In relation with this wet canker, on the same tubers, may appear a dry canker, partial or total, when the tubers meet different environmental conditions.

The mycelium containing bacteria is able in adapted conditions to attack perfectly sound tubers via the lenticels. Tests of various inoculations have given positive results.

The mycelium having abundant bacteria organizes certain sclerotia showing masses of bacteria and of a substance having an oily appearance and the capacity to give place to a new mycelium. The sclerotia form at the surface, rarely deep in the nutritive medium or in the tuber.

A preliminary study of some environmental factors on the spread of Cercospora leaf spot and yield in checked and drilled sugar beets, E. F. Vestal and F. G. Bell (*Amer. Jour. Bot., 18 (1931), No. 9, pp. 705–716, figs. 5*).—The facts that Cercospora leaf spot of sugar beets caused by *C. beticola* requires a relatively high humidity to develop in epidemic form and that lowering the stand favored evaporation suggested the trial of a checking and of a drilling system to test the effects of this control of stand on humidity

and on Cercospora attack. This was done in 1929 and 1930. From July 14 to September 21 the average wind velocity and evaporation rate in the checked plats were increased, respectively, 10 ft. per minute and 3.6 c c over the drilled plats, and the average humidity was from 3 to 10 per cent lower in the checked plats.

Though Cercospora leaf spot did not become epidemic in either 1929 or 1930, less of the disease developed in 1929 in the thinned than in the unthinned plats.

In 1930, with artificial infection, the checked plats developed only one-sixth as many centers of infection as did the drilled plats. The drilled plats gave a tonnage per acre of 28,810 lbs., 15.61 per cent sugar, 80.5 purity, and 4,508 lbs. total sugar. The checked plats gave 31,029 lbs. tonnage, 14.56 per cent sugar, 82.5 purity, and 4,528 lbs. total sugar.

Light intensity was nearly twice as great under the checked beets as under the drilled. The growth rate showed a steady increase in green weight for the checked as compared with a much slower and varied growth made by the drilled beets.

The rate of photosynthesis appeared to be the same for the young and for the mature leaves both on drilled and checked areas, but the old leaves on the checked plants were much more efficient.

Sugar cane mosaic in Trinidad, F. Stell (*Internatl. Sugar Jour., 31 (1929), No. 368, pp. 414, 415*).—The mycologist writes of the mosaic situation in Trinidad, and of the methods and results of control operations.

Only Uba cane and its allies are locally immune to mosaic. The canes already standardized in the island are BH 10 (12) and B 156. Though mosaic has been known to exist on Trinidad since 1920, it is not yet alleged to have become serious, the limiting factor being supposedly the short ratooning period. The insect vector, *Aphis maidis*, has never been numerous. Infected cuttings supposedly cause the chief spread, as they invariably reproduce the disease.

A vigorous and systematic roguing policy is believed to be effective. "The cost which at the start amounted to $2.70 an acre has now been reduced to 94 cts. and will be further reduced this year to half that amount." The percentage of infection during 1920–21 to 1927–28 has been lowered from 7.640 to 0.004. There is said to be an abundance of healthy cane for planting purposes.

Tobacco diseases in Kentucky, W. D. Valleau and E. M. Johnson (*Kentucky Sta. Bul. 328 (1932), pp. 105–154, figs. 24*).—The results of 10 years' study at the station of tobacco diseases are given.

After a discussion of the soil in relation to tobacco diseases, descriptions are given of various physiological diseases, those occurring in plant beds, those attacking the roots, those of the leaf, virus diseases, stalk diseases, and house burn.

Recommendations are given for the control of the various diseases so far as definite means are known.

The influence of the degree of soil humidity on the slime disease caused by Bacterium solanacearum E. F. S. [trans. title], J. H. H. van der Meer (*Bul. Deli Proefsta. Medan, No. 29 [1929], pp. 55, figs. 8; Eng. abs., pp. 36–49*).—From work done during the period December, 1927, to August, 1928, the author concludes that a high level of soil water favors slime disease due to *B. solanacearum* in tobacco. Slime disease does not depend upon root rot as a condition, and apparently *B. solanacearum* can penetrate roots not artificially injured. It also appears that tobacco plants attacked by *B. solanacearum* are killed rapidly as the result of a long dry period.

Abundant watering develops *B. solanacearum* very vigorously. The movement of *B. solanacearum* along tracheae may be favored by negative pressure and by active movements of the plant parts. Theories of several writers are discussed. Luxuriance in the growth of *B. solanacearum* on artificial media is prevented by a deficit of water, and as a result of this condition leaves of a slime diseased plant of tobacco or tomato may wilt.

Immunological studies of mosaic diseases.—I, Effect of formolization, trypsinization, and heat-inactivation on the antigenic properties of tobacco mosaic juice, I, II, T. MATSUMOTO and K. SOMAZAWA (*Jour. Soc. Trop. Agr. (Nettai Nôgaku Kwaishi), 2 (1930), No. 3, pp. 223–233; 3 (1931), No. 1, pp. 24–32*).—The first part of this paper centers largely on the effect of formolization and trypsinization; the second reports the further studies on trypsinization, also studies on the effect of heat inactivation. The data from the experiments are reported in tabular form, with somewhat detailed statements of conclusions, and discussion.

Carbohydrate variations accompanying the mosaic disease of tobacco, A. A. DUNLAP (*Amer. Jour. Bot., 18 (1931), No. 5, pp. 328–336*).—In tobacco, mosaic disease was found to have lowered reducing sugar, disaccharide, dextrin, starch, and pentosan, the greatest reductions occurring in the sugar and starch contents. Starch appeared to be more readily converted into simpler compounds in mosaic plants than in healthy plants. Sugar apparently accumulated more in the mosaic plants. In a given mosaic leaf the differences between light and dark areas as regards carbohydrate content were not so great as between mosaic and healthy leaves.

Some undescribed symptoms of mosaic in Porto Rican tobacco, M. T. COOK (*Jour. Dept. Agr. Puerto Rico, 15 (1931), No 2, pp. 189–191*).—Symptoms of mosaic in Puerto Rican tobacco are described, with emphasis on the fact that the response of the host to the disease may vary with age, also with growth rate and therefore with environment. The author holds that in several mosaic diseases the chlorotic areas do not result from disintegration of the chloroplasts but from developmental inhibition. Later, this is overcome and the chloroplasts increase in size and number. The chlorotic areas do not increase in size (so far as examined by the author) as the result of the invasion of the surrounding cells, but as the result of cell growth and division.

The leaf spot of tobacco: An after symptom of mosaic, M. T. COOK (*Jour. Dept. Agr. Puerto Rico, 15 (1931), No. 2, pp. 183–187, pl. 1*).—Soon after coming to Puerto Rico in 1923, the author noted a peculiar spotting of mature tobacco sent in and examined for fungi but always negative. A sudden outbreak of these spots in the winter of 1929–30 in tobacco mosaic experimental plats affected the mosaic plants inoculated, but only those leaves which due to late inoculations had not developed the mosaic patterns or from which they had disappeared. Plants which did not show these spots one day might show many the next morning. In due time, spots appeared on old leaves of diseased plants. A partial comparative review of the literature supposedly related to this phenomenon is given.

Seed transmission and sterility studies of two strains of tobacco ringspot, W. D. VALLEAU (*Kentucky Sta. Bul. 327 (1932), pp. 43–80, figs. 13*).—The ring spot disease of tobacco is said to be as widely distributed in Kentucky as mosaic and much more widely than other virus diseases of this plant. The same virus is said to cause a disease of cucumbers and potatoes. The weed *Solanum carolinense* was found to carry the virus over winter.

Two strains of tobacco ring spot virus are recognized, one of which causes various shades of green in tobacco leaves, the other yellow patterns. Both

have been transferred from naturally infected potatoes to tobacco. Both types have been found to be transmitted through seed from infected plants. The green type does not show its characteristic symptoms unless the plants are subjected to abnormally low temperatures, whereas the symptoms of yellow ring spot are apparent a few days after germination. As high as 17 per cent seed infection by the yellow strain has been found. Seedlings affected with the yellow ring spot virus are said to grow slowly, and such plants would hardly be set in the field. Those affected with the green strain of the virus grow rapidly and would probably be set in the field, where they might act as sources of infection.

A leaf-edge symptom developing on ring spot plants subjected to low temperatures is described, and its similarity to cold injury is pointed out.

Seed production on ring spot affected plants is said to be abnormally low, and this fact is attributed to partial pollen sterility through microspore infection with the virus. A majority of the pollen grains are reported to be below normal size when the anthers are mature. A study of pollen development is suggested as a possible means of determining whether embryo infection is likely to occur or not.

Five other viruses, alone or sometimes in combination, appeared to have little or no effect on pollen development.

Dusting tomato seed with copper sulfate monohydrate for combating damping-off, J. G. Horsfall (*New York State Sta. Tech. Bul. 198 (1932), pp. 34, figs. 7*).—In continuation of investigations on the control of damping-off of tomatoes (E. S. R., 64, p. 847), the author presents data showing that copper sulfate monohydrate dust as a seed treatment appeared to be more efficacious than either copper sulfate soak or copper carbonate dust in controlling the preemergence phase of damping-off. It seemed to be less efficacious than the soak but more so than the copper carbonate dust in controlling the post-emergence phase. The use of copper sulfate monohydrate as a seed treatment is said to have been tested in 9 greenhouses, in 8 of which it proved to be very efficient. It was of indifferent value in 1, but was injurious in no case. This dust was found to be capable of dilution with as much as three parts of kaolin without altering its effectiveness. In practical use, 0.6 oz. of dust for 1 lb. of seed is recommended. Anhydrous copper sulfate as a seed treatment proved to be nontoxic in ordinary soil, and it stuck to the tomato seed better than the monohydrate dust.

The results obtained in experiments with copper sulfate monohydrate dust, copper sulfate soak, and copper carbonate dust in soil artificially contaminated with *Pythium ultimum* agreed with those obtained in naturally contaminated soil, and this is believed to indicate that *P. ultimum* is the chief pathogene concerned in the unsteamed soil.

The seed treatments, when used in steamed and uncontaminated soil, induced a small lag in the emergence of the plants.

Gray leafspot, a new disease of tomatoes, G. F. Weber, S. Hawkins, and D. G. A. Kelbert (*Florida Sta. Bul. 249 (1932), pp. 35, figs. 14*).—A disease of tomatoes of recent appearance caused by *Stemphylium solani* is described, including the symptoms of the disease, the causal fungus, its morphological and physiological characteristics, and its seasonal development.

The fungus has been reported on tomatoes, peppers, eggplants, and ground-cherries, together with a number of wild solanaceous plants, and is generally distributed in the tomato-growing sections of Florida. For the control of the disease weekly sprayings of tomato plants in the seed beds with a 1–1.5–50 Bordeaux mixture, followed by field sprayings with a 2–3–50 Bordeaux mixture, are recommended.

" Tracheoalternariose " of tomato in Campania [trans. title], F. Sansone (*Bol. R. Staz. Patol. Veg.* [*Roma*], *n. ser., 9 (1929), No. 4, pp. 397–408, figs. 4*).—The communication previously noted (E. S. R., 60, p. 834) is followed up with evidence as to the presence and activity in this connection of fungus growth, in particular the development of a tracheomycosis in tomato due to the development of an Alternaria. Similar behavior toward a pepper is alleged regarding an Alternaria.

Experimental dusting and spraying for the control of watermelon anthracnose, O. C. Boyd (*Ga. State Bd. Ent. Bul. 72 (1930), pp. 50, figs. 9*).—Watermelon anthracnose was controlled appreciably during three years with from 5 to 7 applications each year of a copper-lime dust containing 20 per cent monohydrated copper sulfate for dusting dry vines or 15 per cent for wet foliage and of Bordeaux mixture 3–6(hydrated lime)–50, with a minimum amount of injury to the foliage.

" The use of hand dusters, while satisfactory for the first, and perhaps the second, application, proved entirely inadequate for the entire schedule, due principally to waste of time and materials and to the difficulty in making prompt, timely applications. A two-wheel truck-crop sprayer and duster, on the other hand, with gas engine-operated pump and fan, proved not only efficient in distribution of materials and coverage of vines but practical as well."

Little-leaf or rosette in fruit trees, W. H. Chandler, D. R. Hoagland, and P. L. Hibbard (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 556–560, pl. 1*).—Little leaf, a disease that sharply reduces the size of leaves on affected plum branches, was found by the California Experiment Station to yield to heavy applications of ferrous sulfate in the surrounding soil. However, when chemically pure ferrous sulfate was used there was no beneficial effect. Analyses showed the commercial substance to contain nearly 1 per cent of zinc, which upon test was found the beneficial factor. Among other substances tested without success were copper, magnesium, calcium, cobalt, bromine, iodine, chromium, strontium, barium, tin, nickel, boron, and lead. Large applications of nitrogen or superphosphate were without result. Although the bark of the roots of badly injured trees may contain no more than 10 per cent of the normal potassium content, application of potassium sulfate did not prevent or remedy little leaf.

Maturity and rate of ripening of Gravenstein apples in relation to bitter pit development, F. W. Allen (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 639–645, figs. 4*).—Observations at the California Experiment Station on Gravenstein apples from representative orchards in the Sebastopol district showed a very marked decline in the amount of bitter pit developing after picking with the late harvested lot. Apples held for 10 days at 32, 50, and 70° F. showed but slight bitter pit in the 32° lot, considerable in the 50° lot, and only moderate amounts in the 70° lot. All the fruit was placed in a 70–75° room, and 10 days later there was noted a marked increase in the amount of bitter pit in the 32° lot. At the end of 20 days in the warm room infection was nearly as great in the 32° as in the 50° lot, both showing considerably more severe spotting than the 70° lot. Having established the fact that ethylene hastens the disappearance of starch, the effect of three treatments on bitter pit development was studied with no positive results.

Some physiological studies of Gloeosporium perennans and Neofabraea malicorticis, E. V. Miller (*Jour. Agr. Research* [*U. S.*], *45 (1932), No. 2, pp. 65–77, figs. 12*).—Studies were made of *G. perennans*, the attributed cause of perennial canker, and *N. malicorticis*, the cause of northwestern anthracnose

of apple trees, in the hope that information might be obtained on the relationships of the organisms and possibly of value in developing methods of control.

The fungi were grown on various culture media and inoculated into apples. The physiological reactions of the two were very similar, the changes in temperature, nutrition, H-ion concentration, etc., affecting both organisms very similarly. Some differences were noted in their response to tannic acid in the culture medium. The growth of both species was inhibited, but the retarded growth was most pronounced in the case of *N. malicorticis*. When inoculated into apple fruits the behavior of both fungi was quite similar.

Experiments were carried on with several strains of both species, and greater variability was observed among strains of the same species than between the two fungi themselves.

Black-end and its occurrence in selected pear orchards, L. D. Davis and W. P. Tufts (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 634–638, fig. 1*).—Individual tree records taken by the California Experiment Station in a number of pear orchards in which black end occurred showed that the trees which produced black end fruit one year continued to do so with a high degree of consistency and that the distribution of such trees in orchards appeared to be entirely of random nature. Of the various rootstocks, *Pyrus serotina* produced the greatest percentage of black end trees, Kieffer seedling next, and *P. ussuriensis* the least. In 1931 the first black end fruits were found on trees that produced large numbers of diseased pears throughout the season.

Three virus diseases of the peach in Michigan, D. Cation (*Michigan Sta. Circ. 146 (1932), pp. 11, figs. 2*).—Three virus diseases of the peach, yellows, little peach, and red suture, are reported to occur within the State. Red suture is said to have recently become important throughout the western Michigan peach belt. The symptoms of each of the diseases are described.

A comparison of the three diseases was made in an orchard where five varieties of peach trees were inoculated by budding from infected trees, and the behavior on the different varieties is described. Red suture is considered a distinct disease, different from either peach yellows or little peach.

For the control of these diseases, roguing out all diseased trees, removing all marginal cases, planting only in the best peach soils, and keeping the trees in normal vigor are recommended.

A virus disease of plum and peach, W. D. Valleau (*Kentucky Sta. Bul. 327 (1932), pp. 89–103, figs. 9*).—A description is given of a virus disease of plum and peach trees that has been under investigation for a number of years at the station.

Inoculation experiments by budding showed that the disease was transmissible from the plum to the peach, and that it was quite distinct from peach yellows. Similar virus diseases of the apple and rose are reported.

Suggestions for the eradication of the virus in nursery plantings known to be infected include the recommendation that propagating material be obtained from localities where the disease is not known to occur.

Anthracnose and gray bark of red raspberries, H. W. Anderson and K. J. Kadow (*Illinois Sta. Bul. 383 (1932), pp. 281–292, figs. 7*).—A description is given of a disease of red raspberries known as gray bark, which the authors state is generally distributed in Illinois and is especially prevalent on the variety Latham.

As a result of the investigations it was determined that the disease was a phase of a more serious disease similar to, if not identical with, anthracnose of black raspberries caused by *Plectodiscella veneta*. It is claimed that the gray bark phase of the disease may appear in epidemic form without serious injury to the plants.

For the control of the disease the authors recommend delayed dormant spraying with strong Bordeaux mixture or lime-sulfur. This will prevent the discharge of spores from the overwintering acervuli.

The causation of arricciamento in grapevines [trans. title], L. PETRI (*Bol. R. Staz. Patol. Veg. [Roma], n. ser., 9 (1929), No. 2, pp. 101–130, figs. 7*).—A review is given of recent studies on forms of the condition affecting several plants, notably grapevines, and causing in varying forms and degrees definite abnormalities of growth which have been variously named in different countries, with a discussion of their supposed causation. Certain forms of the rosette disease affecting grain plants are comparatively discussed as regards the cytology and other features.

A summary of powdery mildew control, H. E. JACOB (*So. African Fruit Grower and Smallhold., 17 (1930), No. 5, p. 116, fig. 1*).—Powdery mildew, the most serious fungus vine disease present in California and dangerous every year, is best checked before it gets well started. Sulfur for this use should be extremely fine, easy to work, and free from adulterants. A spray of potassium permanganate (1 lb. to 75 gal. of water with sodium silicate and baking soda spreader) will kill all fungi touched without injuring the vines or staining the fruit. This, when dry, should be followed with sulfur.

Usually from 3 to 5 applications are advisable, first, when the new shoots are from 6 to 8 in. long; second, when they are from 15 to 18 in. long; third, when they are from 2 to 3 ft. long (near blooming time); and fourth, when the berries are about half grown.

Source of witch-broom infection believed to be wild cacao in Surinam (*West India Com. Circ., 45 (1930), No. 818, pp. 43, 44, pl. 1*).—This account consists of extracts from an article on wild cacao in Surinam and Brtitsh Guiana, by J. G. MYERS,[1] who gave therein a partial account of the discoveries and observations of his precedcessor, G. Stahel,[2] as well as of his own later studies in the same locality, and of the cacao trees themselves and of their environment. This is done with a view to accounting, if possible, for the presence of the witches'-broom disease (*Marasmius perniciosus*) in cacao plantations at some distance from the wild cacao. It is thought that the wild cacao must long have been present in the area under discussion.

Until the discovery of this wild cacao the disease had not been recorded on a truly wild host. He has not yet found it on *Theobroma speciosa* in its wild state or on *T. herraniae*, which has recently been recorded from various localities.

The systematic position of the parasitic fungus causing "mal del secco" in lemon trees [trans. title], L. PETRI (*Bol. R. Staz. Patol. Veg. [Roma], n. ser., 9 (1929), No. 4, pp. 393–396, fig. 1*).—The tracheomycosis here mentioned as referred to in an article previously published[3] is herein further dealt with as present in woody branches and trunks of lemon trees in Sicilia (Sicily), and the causal organism is described as the new genus and species *Deuterophoma tracheifila*.

An olive disease in Calabria [trans. title], S. RICCARDO (*Ann. R. Ist. Super. Agr. Portici, 3. ser., 4 (1931), pp. 176–180, pls. 4*).—An account of characters and behavior is given of a disease attacking clive fruits in Calabria, due to the activity of a fungus which may prove to belong in a group already known, as *Phoma fallens*, *P. incompta*, *P. olivarum*, or *P. oleae*, or else in a group to be considered as a new pathological entity.

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[1] Roy. Bot. Gard. Kew, Bul. Misc. Inform., No. 1 (1930), pp. 1–10, pls. 2.

[2] Indische Mercuur, 43 (1920), No. 39, pp. 681, 682, figs. 9.

[3] Bol. R. Staz. Patol. Veg. [Roma], n. ser., 9 (1929), No. 3, pp. 282–290, fig. 1.

Pathological, histological, and symptomatological studies on pineapple root rots, C. P. Sideris and G. E. Paxton (*Amer. Jour. Bot., 18 (1931), No. 6, pp. 465–498, figs. 25*).—This paper lists the organisms which have been demonstrated to occur in rotting pineapple roots in the field and to cause root decay when healthy plants are inoculated with their pure cultures. A few closely related organisms, not originally found in field-grown plants but capable of parasitizing pineapple roots, are also included. It has been found possible to distinguish many of these organisms by their specific behavior in the host tissues, especially as regards the formation and characteristics of their oospores and certain other reproductive parts.

Pineapple root rots are grouped into a rapid soft root rot (*Pythium* spp.), a slow hard root rot (*Fusarium* spp.), or a slow soft root rot (*Verticillium* spp.).

The susceptibility of pineapple (*Ananas sativus*) roots to different species of Nematosporangium, Pythium, Pseudopythium, and Phytophthora varied as between the different genera and also between the different species of the same genus. Nine species of Nematosporangium, 11 of Pythium, 1 of Pseudopythium, and 2 of Phytophthora were pathogenic to pineapple roots, ranging from highly aggressive to very weak parasites. *N. rhizophthoron* and *N. polyandron* cause the greater portion of root rot attributable to this genus.

Root rot caused by pythiaceous organisms is supposedly one of the important causes for the development of the pineapple disease known as wilt, but, for which the authors prefer the term shriveling as more descriptive of the condition described. A Fusarium closely related to *F. affine* was found to be able to establish itself on devitalized or dead small laterals, kill the healthy tissues by means of toxic metabolic by-products, and then advance inward. Roots may recover if the injury is slight. Drought conditions favor infection of laterals. Damage caused under field conditions may be of minor importance. A *Verticillium* sp. supposed to be closely related to *V. buxi* and to *V. heterocladum*, isolated from diseased roots of pineapples, proved on inoculation to cause injury and death to this plant. The losses from this are, however, supposedly low.

A leaf disease of Thea sinensis [trans. title], M. Cuzzi (*Bol. R. Staz. Patol. Veg. [Roma], n. ser., 9 (1929), No. 4, pp. 373–392, figs. 9.*).—What is claimed as a new tea leaf disease is here dealt with. This is said to manifest itself particularly in humid seasons, showing dry leaf spots from 1 to 3 cm in diameter, which are described. The organism may bear the name *Cercoseptoria theae* n. comb.

Control measures for pecan scab with special reference to dusting, O. C. Boyd (*Ga. State Bd. Ent. Bul. 70 (1928), pp. 18*).—Information is furnished on spraying for pecan scab (*Fusicladium effusum*), with directions for adding poison for the case bearer, either in spray or in dust. The cost of treatment is also discussed.

Diseases of Narcissus, F. P. McWhorter and F. Weiss (*Oregon Sta. Bul. 304 (1932), pp. 41, figs. 21*).—The results are given of investigations conducted cooperatively by the station and the U. S. Department of Agriculture on diseases of narcissus and their control.

The bulb diseases described are nematode disease (*Tylenchus dipsaci*), narcissus mosaic or gray disease caused by a virus, scale and neck rots (*Sclerotium rolfsii*), dry scale rot or black scale speck (*Sclerotinia gladioli* or related species), neck rot (*Stagonospora curtisii* and *Botrytis narcissicola*), soft rot of bulbs (*Rhizopus nigricans*), basal rot (*Fusarium* sp.), and root-plate rot. The foliage diseases described are smoulder (*B. narcissicola*), leaf scorch (*S. curtisii*), and Ramularia blight (*R. vallisumbrosae*).

For the control of these diseases, the authors recommend hot water treatment for nematodes and the addition of formaldehyde or other disinfectant in the hot water bath when the treatment is given. For the bulb rots, hot water treatment every two or three years, and after such treatment the dipping or soaking of the bulbs for a short time in some fungicide to prevent the spread of rot and to improve the general condition of the root plates are recommended. For leaf spot control, the use of chemical fungicidal treatment of the bulbs and rotation of the crop are preferred to spraying the leaves during the growing season.

Resistance of Oenothera to the attack of Synchytrium fulgens, S. KUSANO (*Jour. Col. Agr., Imp. Univ. Tokyo, 10 (1929), No. 4, pp. 313–327, pl. 1, figs. 2*).—"*S. fulgens* is able to invade the epidermal cell (aerial organs) of the resistant species of Oenothera, *O. odorata* and *O. sinuata*, equally as well as that of the susceptible species (*O. lamarckiana* and *O. biennis*. In *O. odorata*, however, the outer wall of the epidermis under normal environmental conditions is developed so strongly as to prevent entry of the parasite. When grown under moist conditions the degree of infection is quite similar to that of the proper host, and the invaded host-cell favors the development of the parasite. In *O. sinuata* the relation is otherwise; the cell wall is easily penetrable, but the entered parasite is not able to develop. . . . The current conception of resistance and susceptibility is not appropriate at least in the case of the intracellular parasite under consideration."

Resistance in wild varieties of Castanea vesca to the ink disease [trans. title], L. PETRI (*Bol. R. Staz. Patol. Veg. [Roma], n. ser., 9 (1929), No. 3, pp. 291, 292*).—Tests of young wild chestnuts sent the author in December from Heidelberg, Germany, and tested the next June with *Blepharospora* (*Phytophthora*) *cambivora* showed differences in susceptibility so wide that those of one group yellowed in 12 and died in 18 days, those of a second group yellowed in 22 and died in 30 days, and those of a third group remained healthy.

The Dutch elm disease—a warning, F. C. STRONG (*Michigan Sta. Quart. Bul., 15 (1932), No. 1, pp. 6–8*).—Attention is called to the Dutch elm disease caused by *Graphium ulmi*, which has been reported from several localities in Ohio. The chief symptoms of the disease are described as a means for determining its presence.

Curative methods for root rots [trans. title], L. PETRI (*Bol. R. Staz. Patol. Veg. [Roma], n. ser., 9 (1929), No. 3, pp. 255–272, figs. 4*).—The author reviews several forms and causes of tree root rots, means for their prevention, and curative measures, including chiefly tree surgery with appropriate disinfectants and adequate fertilizers.

Some minor stains of southern pine and hardwood lumber and logs, T. C. SCHEFFER and R. M. LINDGREN (*Jour. Agr. Research [U. S.], 45 (1932), No. 4, pp. 233–237*).—In connection with a study of blue stain of lumber and its control, several bright colored stains were observed. Investigations proved that they were caused by species of Fusarium, Penicillium, Gliocladium, and Trichoderma. Chemical treatments for the prevention of blue stain appeared to favor the development of the fungi which caused these minor stains.

The mycelium of the fungi appeared to be concentrated in the resin ducts and parenchyma cells of the wood rays, and to a limited extent in the wood and ray tracheids. The coloration was due either to the color of the mycelium alone or to the combined color of the mycelium and a soluble pigment absorbed by adjacent wood cells.

The treatments giving the most satisfactory control of these stains were those with sodium carbonate and bicarbonate, sodium dinitrophenolate, sodium orthophenyl phenolate, or lime-sulfur.

ECONOMIC ZOOLOGY—ENTOMOLOGY

[Notes on economic insects and their control] (*Jour. Econ. Ent., 25 (1932), No. 4, pp. 930–937*).—The contributions here noted (E. S. R., 67, p. 705) are as follows: Privet Thrips, *Dendrothrips ornatus* Jabl., by E. P. Felt (p. 930); An Early Quarantine in Puerto Rico, by M. D. Leonard (pp. 930, 931); Injury by a Japanese Weevil, *Pseudocneorrhinus setosus* Roelofs, by W. E. Britton (p. 931); First Record of *Hypera postica* Gyll. in the San Joaquin Valley, California, by R. A. Blanchard (p. 931); Apple Leaf Curling Midge, *Dasyneura mali* Kieffer, by E. P. Felt (p. 932); Reduction of White Grub Injury by Bordeaux Mixture, by J. R. Stear (p. 932); Disposition of Peach Drops Infested with *Conotrachelus nenuphar* Larvae by Submergence in Water, by O. I. Snapp and J. R. Thomson (p. 933); Temperature as a Measure of an Insect Population, by S. E. Flanders (p. 934); Thrips Injury [*Frankliniella insularis* Frank., *F. cubensis* Hood, and *F. difficilis* Hood] to Citrus and Rose in Puerto Rico, by M. D. Leonard (pp. 934, 935); Hibernation of the Striped Cucumber Beetle, *Diabrotica vittata* (Fab.), and Records of Spring Food Plants, by P. O. Ritcher (pp. 935, 936); and Permanent Preservation of Biological Specimens in Gelatin, by C. W. Eagleson (pp. 936, 937).

[Report of work in economic entomology] (*Tennessee Sta. Rpt. 1931, pp. 34, 45–48*).—Reference is made to a brief preliminary chemical study of spray residues on peaches, including fluorine and arsenic, conducted by W. H. MacIntire. Work conducted by S. Marcovitch, briefly reported upon, includes the control of arsenical injury and experiments with barium fluosilicate and cryolite on peach; control of the tobacco flea beetle; and notes on insect pests of the year.

[Report of work in entomology] (*Utah Sta. Bul. 235 (1932), pp. 55–59, figs. 4*).—Data are reported on infestation of irrigated and dry farm wheat by the wheat straw worm; occurrence of the wheat joint worm; grasshoppers and the parasite *Sarcophaga kellyi* Ald.; the boxelder bug; and the occurrence of and the relation to production of seed of insects on alfalfa, including the tarnished plant bug, the superb plant bug (*Adelphocoris superbus* Uhl.), thrips, the alfalfa weevil, and the clover seed chalcid; and beet leafhopper and potato psyllid investigations.

Observations on a combined boll weevil and pink bollworm infestation in northern Mexico, C. S. Rude and C. L. Smith (*Jour. Econ. Ent., 25 (1932), No. 4, pp. 772–776, fig. 1*).—During a combined heavy boll weevil and pink bollworm infestation of cotton which occurred at Tlahualilo, Durango, Mex., in 1931, weekly records were made on the percentage of both square and boll infestations by these two species. It was found that the multiplication and development of neither species was checked by that of the other.

Technique for artificial inoculations of the cotton plant, W. S. Cook (*Jour. Econ. Ent., 25 (1932), No. 4, pp. 766–769, pl. 1*).—A description is given of an apparatus and the technic employed in making artificial inoculations of the cotton plant in insect transmission work with plant diseases. A full description of the micromanipulator and of the making of the capillary glass points is also given.

A visual method of comparing toxicity of contact dusts, J. R. Stear (*Jour. Econ. Ent., 25 (1932), No. 4, pp. 929, 930, pl. 1*).—A description is given of a method of testing comparative toxicity of contact dusts in which the tracks made by dusted insects in dust films are used as indicators of toxicity.

The performance of certain contact agents on various insects.—Studies in contact insecticides, V, W. C. O'Kane, W. A. Westgate, and L. C. Glover (*New Hampshire Sta. Tech. Bul. 51 (1932), pp. 20, figs. 17*).—This fifth contri-

bution in the series (E. S. R., 67, p. 429) summarizes the results of work in which the contact angles of several so-called wetting agents on a number of species of insects were measured. Fifteen species of insects were employed in the tests, in which the contact agents included sodium laurate, triethanolamine oleate, sodium oleate, saponin, and Penetrol. Attention is called to the sources of error in measurements of contact angles on the surface of an insect. The surface tensions were measured, and contact angles on paraffin-coated slides were determined.

The materials studied gave definite variations in contact angles on the various species of insects. Sodium laurate at 0.25 to 0.5 per cent gave in general optimum performance, but was inferior to some other contact agents in the case of three species. Saponin solution was notably inferior. Triethanolamine oleate and Penetrol gave favorable contact angles on some insects but unfavorable on others. Certain insects considered resistant to contact insecticides, such as the squash bug and two species of grasshoppers, gave distinctly unfavorable contact angles with all the materials studied. Certain other insects, such as two species of sawfly larvae, gave distinctly favorable contact angles. The adults of the house fly showed definitely favorable results in the case of the soaps used. The data given indicate that the nature of the insect integument is an important factor in angle of contact studies.

A comparison between rotenone and pyrethrins as contact insecticides, J. M. Ginsburg and J. B. Schmitt (*Jour. Econ. Ent., 25 (1932), No. 4, pp. 918–922*).—At the New Jersey Experiment Stations the toxicity tests of derris extract, pure rotenone, and pyrethrum extract were carried out under laboratory conditions during the summer of 1931. Large differences in the toxicity to honeybees and aphids were observed. It is concluded that (1) derris extract and pure rotenone in high dilution are vastly more toxic to aphids than to honeybees, and (2) pyrethrum extract in high dilutions is more toxic to honeybees than to aphids.

Comparison of oxidation rates of liquid lime-sulfur and solutions of dry lime-sulfur, D. E. Bullis (*Jour. Econ. Ent., 25 (1932), No. 4, pp. 922–928, figs. 4*).—In work at the Oregon Experiment Station the rate of oxidation of liquid lime-sulfur and dry lime-sulfur solutions is the same at equal concentrations of calcium polysulfide. Sludge does not materially affect the rate of oxidation.

Insecticidal control of the common black field cricket (Gryllus assimilis Fabr.), J. A. Munro and L. A. Carruth (*Jour. Econ. Ent., 25 (1932), No. 4, pp. 896–902, pl. 1, figs. 2*).—This is a report of experiments conducted at the North Dakota Experiment Station to determine the relative values of various insecticides used in baits and as dusts for the control of the field cricket. Sodium fluosilicate, as used in baits, proved to be a most satisfactory insecticide. For use in houses and other places where bait could not be applied satisfactorily pyrethrum powder applied as a dust proved very effective in killing the insects.

The olfactory responses of the cockroach (Blatta orientalis) to the more important essential oils and a control measure formulated from the results, A. C. Cole, jr. (*Jour. Econ. Ent., 25 (1932), No. 4, pp. 902–905*).—The responses of the oriental cockroach to some of the more important essential oils were determined by the use of an improvised Y-tube olfactometer. "These responses were positive or negative, depending upon the oil used in each case. There was also a small percentage of reverse responses, especially when the concentration of the oil was not high. The results of these tests were tabulated individually and collectively. With the results as a starting point, a satisfac-

tory bait was developed which killed the roaches in slightly more than three hours' average time. This bait is also toxic to house-infesting ants providing a little sugar is substituted in the formula."

The bait consists of gelatin 6 g, dilute beef broth 200 c c, mercuric chloride (U. S. P.) 0.5 g, and an attractant, either banana oil, oil of sweet orange, oil of apple, or oil of pineapple, 1 drop. The gelatin is dissolved in the hot beef broth and the mercuric chloride added and then the attractant. Upon cooling it develops a gelatinous consistency, and the bait may be cut into uniform-sized pieces by the use of a small cookie cutter. It is pointed out that the mercuric chloride, in addition to being the poison that kills the cockroach, also prevents the formation of colonies of bacteria and molds which might develop on the gelatin.

Poisoned bait controls grasshoppers, R. Hutson (*Michigan Sta. Quart. Bul., 15 (1932), No. 1, pp. 20–22*).—Attention is called to the value in grasshopper control of the poisoned bait previously described (E. S. R., 61, p. 656).

Life history of Thrips tabaci L. on Emilia sagittata and its host plant range in Hawaii, K. Sakimura (*Jour. Econ. Ent., 25 (1932), No. 4, pp. 884–891, fig. 1*).—This contribution from the Hawaiian Pineapple Canners' Experiment Station deals with the host plant range in Hawaii of the onion thrips, which has been found by Linford (E. S. R., 67, p. 567) to be a transmitter of pineapple yellow spot disease. The species has been collected from 66 different plants. The life history of the species on *E. sagittata,* one of the most important wild hosts of both insect and virus, has been studied. On this host plant chlorotic malformation of the leaves results from the insect's feeding. Parthenogenetic reproduction occurs normally under Hawaiian conditions, and the biotic potential of the insect is extremely high.

Biology and control of the corn leaf aphid with special reference to the Southwestern States, V. L. Wildermuth and E. V. Walter (*U. S. Dept. Agr., Tech. Bul. 306 (1932), pp. 22, figs. 13*).—This report of a study of the corn leaf aphid, which was commenced in 1910 by the senior author at El Centro, Calif., and continued the following year and up to the present time at Tempe, Ariz., is dealt with under the headings history of the corn leaf aphid in the United States, distribution, food plants, field history, type and extent of injury, life history, viviparous forms, sexual forms, natural checks, and control.

It is pointed out that this pest does the greatest damage in the United States when feeding upon barley, grain sorghums, and corn and in the transmission of the mosaic diseases on sugarcane. "It is not known how or whether this aphid overwinters in the North. It has been suggested that it may migrate from the South. Cage records show the maximum number of generations to vary from 9 in central Illinois to from 35 to 41 at Tempe, Ariz., and from 39 to 50 at Brownsville, Tex. Males are recorded for the first time (Tempe, Ariz.) and are illustrated and described herein. This insect can be controlled on corn and grain sorghums by early planting and on barley by early planting and pasturing the infested fields in case of an outbreak."

A list is given of 22 references to the literature.

Relation between wind distribution of winged forms and infestation of the turnip aphis, Rhopalosiphum pseudobrassicae Davis, J. N. Roney (*Jour. Econ. Ent., 25 (1932), No. 4, pp. 776–780, fig. 1*).—A study of screen collections of the turnip aphid and analyses of the infestations on 30 plantings in several trucking communities by the Texas Experiment Station shows that the infestation of the various plantings has a definite influence on other plantings in the same community. Neglect in controlling an infestation or failure to prevent its spread by plowing the crops under before heavy migration of the

aphids begins may mean the difference between profit and loss to that community.

Studies of populations of Pseudococcus brevipes (Ckl.) occurring on pineapple plants, W. CARTER (*Ecology, 13 (1932), No. 3, pp. 296–304, figs. 4*).—Studies at the Hawaiian Pineapple Canners' Experiment Station show that the pineapple mealybug "becomes established on planting material while this material is still attached to the mother plant. The species persists on this material while it is drying on the trimming ground, and on occasion the mealybug can reproduce under these circumstances so that large populations of mealybugs may be planted in new fields along with the plants. Most of these populations disappear, either as the result of failure of ants to become established in the same areas quickly enough, or by the action of predators, or by the replanting process which eliminated retarded or sickly plants. Occasional plants remain infested, however.

"After the field is planted infestation occurs first on the outer edge and moves in gradually. There is some evidence that the rate of movement is influenced by the size of initial populations. In new fields bordered by wild vegetation or by old pineapple plantings infestation is extremely variable both as to time and size even within localized areas, but in some cases results in high populations being established within 6 months after planting. This variability in infestation sometimes persists over a long period of time. The big-headed ant, *Pheidole megacephala* Fab., is the principal factor in mealybug movements from wild hosts and old pineapple fields into new plantings."

Bioclimatograph, an improved method for analyzing bioclimatic relations of insects, B. P. UVAROV (*Ecology, 13 (1932), No. 3, pp. 309–311, fig. 1*).—A modification of the Ball-Taylor climatograph method for analyzing the relations of insects to the climate of a given region, or of a season, is offered with a view to its being tested by ecologists and improved upon.

Two economic greenhouse mealybugs of Mississippi: The citrus mealybug and the Mexican mealybug, L. E. MYERS (*Jour. Econ. Ent., 25 (1932), No. 4, pp. 891–896, pls. 2*).—In this contribution from the Mississippi State Plant Board and the Mississippi Experiment Station the life histories of the citrus mealybug and *P. gossypii* (T. & Ckll.) are compared under greenhouse conditions. The citrus mealybug completed eight life cycles in 365 days, while 381 days were required for *P. gossypii* to complete the same number. Mortality, parthenogenetic reproduction, effect on hosts, and recognition characters are discussed.

The citrus blackfly in Asia, and the importation of its natural enemies into tropical America, C. P. CLAUSEN and P. A. BERRY (*U. S. Dept. Agr., Tech. Bul. 320 (1932), pp. 59, figs. 19*).—In the foreword to this bulletin, C. L. Marlatt states that the introduction and establishment of important Malayan parasitic and predacious enemies of the citrus black fly in the American Tropics, here recorded, is one of the outstanding successes in the natural control of economic insects. The black fly has been for many years a very serious obstacle to the citrus industry in Cuba and had in addition a fairly wide distribution elsewhere in the American Tropics. In the New World it was first discovered in Jamaica in 1913, and the infestation has spread to Cuba, Haiti, Panama, Costa Rica, and the Bahama Islands. Its threat to the citrus industry in the United States led to the formulation of a cooperative project between this Department and the Department of Agriculture, Commerce, and Labor of Cuba.

The first part of this contribution deals with the citrus black fly, including its distribution, status as a citrus pest in the Far East, host plants, life history

and habits, and mortality factors, followed by a discussion of climatic conditions in the infested regions and the potential status of the black fly in the United States. The natural enemies of the citrus black fly, methods of rearing, shipment, and colonization are then considered at length (pp. 19–56.)

It is pointed out that the control of the citrus black fly in the Far East, where it is of no economic importance, is due almost exclusively to the mortality effected by its natural enemies. Of these there are found six species of parasitic chalcidoid Hymenoptera, 5 coleopterous predators, 2 dipterous predators, 1 neuropterous predator, and 1 lepidopterous predator. The internal parasites are responsible for an average mortality of 54 to 67 per cent in each generation in the field. In all sections approximately 50 per cent of the parasites are destroyed in the late larval or pupal stage by hyperparasites of the genus Ablerus.

Of these natural enemies, 1 hymenopterous parasite, *Eretmocerus serius* Silv., and 2 coccinellid predators, *Scymnus smithianus* and *Cryptognatha* sp., were introduced into and successfully established in Cuba as a result of importations first released in 1930. Commercial control has been effected by *E. serius* in most of the groves in which the early liberations were made, this being normally effected within 8 to 12 months from the first liberation. The extent of parasitization in these groves at the time of control has ranged from 72 to 78 per cent. Colonies of Eretmocerus have been liberated in many groves in all of the Provinces of Cuba, and have also been sent to the Canal Zone, the Bahamas, and Haiti.

Among the coccinellid predators *Cryptognatha* sp. was able, in several instances, to effect rapid control but its effectiveness is said to be very uncertain. *S. smithianus* is apparently not adapted to Cuban conditions, as reproduction is largely suspended during the summer months.

On the basis of a study of meteorological conditions in the infested regions of tropical Asia and America, it is concluded that while the citrus black fly is a potential major pest of citrus in Florida it would be of little importance under California conditions. The establishment of its natural enemies greatly reduces the possibility of its entry into the United States.

California red scale and its control in the lower Rio Grande Valley of Texas, S. W. Clark and W. H. Friend (*Texas Sta. Bul. 455 (1932), pp. 35, figs. 15*).—This is a summary of information based on studies of the California red scale as it occurs in the citrus-growing area of the Rio Grande Valley, including life history and habits, natural control, control by fumigation and by spraying, etc. This scale, which is the chief insect attacking citrus in the area, has been found infesting 35 varieties of plants in the lower valley. It not only decreases the market value of the fruit from infested trees but weakens and in extreme cases destroys its hosts. The pest gives birth to living young throughout the whole year in the valley, the maximum rate of production occurring during the summer and early fall months. "The broods of red scale are continuous and overlap to such an extent that differentiation between the generations is impossible. The low temperatures that occurred during the winter of 1929–1930 had little effect upon the emergence of young scale or upon the normal winter mortality of red scale.

"Fumigation with hydrocyanic acid gas, under the conditions of these experiments, gave satisfactory scale kill, but the proximity of infested host plants and the climatic conditions which prevailed during these tests were not favorable for the general use of this method of scale control.

"Oil emulsion sprays of the quick-breaking type, utilizing slow drying oils, have proved to be more effective in scale control than those using a more rapid

drying oil. Many of the proprietary oil sprays used in these tests gave satis factory control of red scale when applied at the proper time. Oil sprays during the summer period were more effective in scale control than were those applied at other seasons of the year. Plats of trees heavily infested with scale, sprayed once with oil emulsion during May and once during July, produced higher percentages of clean fruit than did those plats receiving single applications. Where scale control secured during the previous season was satisfactory, it is probable that a single, well-timed application of oil emulsion spray during the summer season will keep red scale under control.

"Lime-sulfur solution was ineffective in red scale control when applied six times at monthly intervals throughout the spring and summer season.

"The tank-mixture method of applying oil sprays is apparently practicable under lower Rio Grande Valley conditions. The importance of thorough coverage of all portions of the citrus tree with the oil spray has been clearly demonstrated during the progress of these experiments."

Preliminary experiments on the toxicity of certain coal-tar dyes for the silkworm, F. L. Campbell (*Jour. Econ. Ent., 25 (1932), No. 4, pp. 905–917, pl. 1*).—In toxicity studies "aqueous solutions of 21 representative coal-tar dyes were administered to silkworms by mouth and by injection. The 11 acid dyes and 6 of the 10 basic dyes did not kill the larvae by either method of administration at a dose of 0.05 mg per gram of body weight. The 4 lethal basic dyes were (1) malachite green, (2) safranine bluish, (3) brilliant green, and (4) crystal violet. By mouth their relative toxicity was in the order just given, malachite green being the most toxic. By injection the order was (3), (1), (4), (2).

"Since malachite green is more toxic than acid lead arsenate for the silkworm, it might be desirable to use it for the coloring of white arsenicals and fluorine compounds to comply with such laws as may be enacted on the coloring of insecticides. Malachite green and other toxic dyes, being soluble in water and not strongly adsorbed by lead and calcium arsenates, might be added to the arsenicals in the form of adsorption compounds with clays, such as bentonite. When the concentration of the dye on the clay is such that it can not be washed out with water, it may still be liberated in the alimentary tract of the insect. The colorless, insoluble leuco and color bases of malachite green were not toxic to the silkworm.

"Neutral red, when administered by mouth, colored the integument of third-instar silkworms. The color was retained throughout the remainder of the larval stage. The suggestion is made that vital stains might be used for the identification of insects for experimental purposes.

"A description of the construction and operation of a simple injection pipette is given. It was used not only for the injection of dyes into silkworms but also for the injection of organic liquids into the grasshopper *Melanoplus differentialis*. Methyl alcohol, ethyl alcohol, and ether, having only a temporary effect, might be used as solvents for poisons insoluble in water. The median lethal dose of nicotine by injection into fifth-instar silkworms was about 0.0015 mg per gram."

The oleander caterpillar, Syntomeida epilais Walker, H. E. Bratley (*Fla. Ent., 15 (1932), No. 4, pp. 57–64, figs. 2*).—An account is given of the distribution and life history, with a description of the immature stages, of *S. epilais*, an important enemy of the oleander.

A new method of controlling the peach borer, Syanthedon exitiosa Say, with special application to young trees, O. I. Snapp (*Jour. Econ. Ent., 25 (1932), No. 4, pp, 786–799*).—This is a report of experiments conducted during

the seasons 1930 and 1931 with paradichlorobenzene-crude cottonseed oil emulsion applied at various strengths to peach trees 1, 2, 3, 6, and 7 years old. "The experiments of 1931 included also paradichlorobenzene-mineral oil emulsion and naphthalene-crude cottonseed oil emulsion applied as sprays at various strengths and paradichlorobenzene crystals and naphthalene crystals applied in a continuous band on the ground about 1.5 in. from the tree trunk.

"Paradichlorobenzene-oil emulsions carrying 0.25 oz. of the chemical to each 1- or 2-year-old tree, 0.5 oz. to each 3-year-old tree, and 1 oz. to each 6- or 7-year-old tree, with several shovelfuls of soil placed around the tree after spraying, proved to be safe and very effective against the peach borer. Those emulsions applied as sprays are apparently the only safe means of controlling the peach borer in 1-, 2-, and 3-year-old peach trees under conditions in the South. This method of peach borer control for older trees is an improvement over the paradichlorobenzene-crystal treatment, as it is easier to use and takes less time for the application. Naphthalene-crude cottonseed oil emulsion and naphthalene crystals were injurious to peach trees and not effective against the peach borer."

Observations on the biology of the peach borer in Roane County, Tennessee, Harriman, Tenn., 1931, H. G. Butler (*Jour. Econ. Ent., 25 (1932), No. 4, pp. 781–786, fig. 1*).—This paper reports observations on the biology of the peach borer and the results of control experiments in eastern Tennessee during the fall of 1930 and the summer of 1931. In this area October 1 is considered to be near the optimum date for control treatments. The peak period of emergence of adults of the peach borer occurred between September 4 and September 7. The average potential oviposition of 25 moths was 767.2 eggs each during the season of 1931.

Migration and population studies of the cotton bollworm moth (Heliothis obsoleta Fab.), J. C. Gaines (*Jour. Econ. Ent., 25 (1932), No. 4, pp. 769–772, pls. 2*).—At the Texas Experiment Station a cart type of screen trap, which was pushed along over cotton in the field, proved quite successful in obtaining information regarding the extent of local migration and the abundance of bollworm moths in the fields. Correlating these records with those taken in connection with oviposition, bollworm injury, and rate of plant growth, it was found that oviposition and the rate of plant growth were closely associated, but that there was no relation between the moth population and the oviposition in these fields.

Host plant studies of the pink bollworm, C. S. Rude (*Jour. Econ. Ent., 25 (1932), No. 4, pp. 751–759*).—The author reports that at Tlahualilo, Mex., in the State of Durango, the following species of native, wild, malvaceous plants were found to be host plants of the pink bollworm of cotton; *Hibiscus cardiophyllus, H. coulteri,* and *H. denudatus.* Two species of cultivated malvaceous plants were also recorded as host plants, namely, okra and hollyhock. The comparative importance of these plants in maintaining pink bollworm infestation in the absence of cotton is discussed, together with notes on distribution and habitat.

Biology of the pink bollworm at Presidio, Texas, W. L. Owen, jr., and S. L. Calhoun (*Jour. Econ. Ent., 25 (1932), No. 4, pp. 746–751*).—This contribution from the Texas Experiment Station and the U. S. D. A. Bureau of Entomology, cooperating, presents a brief summary of the more important findings concerning the life cycle and seasonal history of the pink bollworm as studied at Presidio.

Timing the spray applications by the emergence of the codling moth, L. Haseman and P. H. Johnson (*Jour. Econ. Ent., 25 (1932), No. 4, pp. 849–855,*

figs. 2).—In control work in Missouri breeding cages and moth traps are being used to determine codling moth and worm development through the spring, summer, and early fall, the spray applications being timed by actual moth emergence. The results show that equal or better control can be secured with from one to three fewer applications if they are timed to best advantage.

Orchard sanitation and the codling moth, G. S. Hensill (*Jour. Econ. Ent., 25 (1932), No. 4, pp. 856–859, figs. 2*).—Report is made of an unusually heavy flight of the codling moth in an apple section of the Santa Clara Valley in California during the season of 1931, as determined by use of bait traps. In six months, from the first of April to the last of September, a total of 23,900 moths was taken from 12 bait traps in two immediately adjoining orchards. The heaviest flights were in the month of April, during which 11,917 moths were taken, and during one week, from April 15 to 21, a total of 6,131 moths was taken. Lack of orchard sanitation definitely accounts for the conditions described.

Relative toxicity of some dusts to Carpocapsa pomonella, R. E. Barrett (*Jour. Econ. Ent., 25 (1932), No. 4, pp. 859–863*).—Of the fluorine compounds tested, barium fluosilicate and synthetic cryolite were the only ones that gave promise for use in controlling the codling moth on walnut. Talc of 400 mesh furnishes better protection than lime. A dust of 35 per cent barium fluosilicate or synthetic cryolite and 65 per cent talc of 400 mesh is recommended.

Oriental fruit moth studies in South Carolina, 1931, W. C. Nettles (*Jour. Econ. Ent., 25 (1932), No. 4, pp. 799–807, figs. 3*).—A study of the larval parasites of the oriental fruit moth by the South Carolina Experiment Station during 1931 demonstrated the ability of *Macrocentrus ancylivorus* Roh. to survive successfully the winter of 1930–31. Of the oriental fruit moth larvae feeding in twigs, 34.5 per cent were destroyed by parasites during the season. There appeared to be a synchronization between the abundance of parasite and host prior to the time of Elberta harvest.

"Insectary studies indicate that there is a definite relationship between temperatures at sunset and egg deposition. No eggs were deposited when sunset temperatures were lower than 60° F.; egg deposition was gradually accelerated as temperatures increased from 60 to 75°; optimum deposition occurred from 76 to 85°; and egg deposition was greatly retarded when sunset temperatures in excess of 85° were recorded. Considerable significance is attached to the fact that sunset temperatures were unusually high and egg laying materially reduced during the 12-day period (June 22–July 2) which coincided with one-third of the time during which second brood eggs were being deposited.

"Life history studies with regard to picking time of Elbertas indicate that overwintering larvae could have developed in late-ripening Elbertas, especially drops or those remaining on trees, and in all varieties ripening thereafter."

Observations on the distribution of hibernating oriental fruit worms, L. F. Steiner (*Jour. Econ. Ent., 25 (1932), No. 4, pp. 864–868*).—This contribution from the Indiana Experiment Station emphasizes the fact that "the efficiency of early spring cultivation and the peach tree borer paradichlorobenzene treatment in oriental fruit worm control is dependent upon the distribution of the surviving hibernating population on and about the tree. Examinations of 10 trees in southern Indiana indicate that this distribution is extremely variable and subject to such factors as variety, ripening date, amount of rough bark on the tree, débris on the ground, and winter mortality. Elbertas were found to have 100 per cent of their hibernating larvae on the tree, Krummels averaged 85.6 per cent, Fleener Clings 20 per cent, and White Heath Clings 18.6 per cent. Small bits of weed stems held more hibernating larvae than

anything else under the trees. In 1929–30 less than 1 per cent of the larvae hibernating above the snow line survived parasitism and low temperatures. Cultivation and the paradichlorobenzene treatment under such climatic conditions should be effective as partial oriental fruit worm controls. Under normal Indiana conditions, however, they appear useless when applied to early ripening varieties or to any variety when much of the trunk is covered with rough bark."

Studies on the host plants of the European corn borer (Pyrausta nubilalis Hubner) in southeastern Michigan, F. F. Dicke (*Jour. Econ. Ent., 25 (1932), No 4, pp. 868–878*).—The extent of European corn borer infestation in economic plants and weeds in southeastern Michigan from 1927 to 1929, inclusive, is reported upon.

Some studies on the planting rate of corn in relation to oviposition, population, and injury by the European corn borer, G. A. Ficht (*Jour. Econ. Ent., 25 (1932), No. 4, pp. 878–884*).—This contribution from the Indiana Experiment Station reports upon the progress made during two seasons of study (1930 and 1931) pertaining to the planting rate of corn in relation to corn borer behavior, with special reference to oviposition, population, survival, and injury. Egg distribution in the different rates of planting did not appear to be directly proportional to either unit area or plant units but was more dependent on the former. Populations were greater in the thinner plantings, and larval survival increased with the thickness of stand. The injury also seemed greater in the sparser plantings.

Flies and mosquitoes commonly found about Michigan homes, E. I. McDaniel (*Michigan Sta. Circ. 144 (1932), pp. 27, figs. 5*).—This is a practical account.

Sturmia inconspicua Meigen, a tachinid parasite of the gipsy moth, R. T. Webber (*Jour. Agr. Research [U. S.], 45 (1932), No. 4, pp. 193–208, figs. 6*).—The tachinid parasite here dealt with is not only an effective European parasite of the gipsy moth but is also the most important European tachinid parasite of the introduced pine sawfly, and because of the recent introduction of this sawfly in the Northeastern States the establishment of the parasite should prove of decided benefit.

This tachinid, which is indigenous to central Europe and is commonly found in northern Africa, was first introduced into the northeastern part of the United States in 1906. Between 1907 and 1910 other introductions were made, but attempts made the following years to recover the species failed. In the years 1923 to 1925, inclusive, large colonies were liberated, and in 1929 the first recovery was made.

The tachinid "passes the winter as a first-stage maggot within the cocooned larvae of several species of sawflies of the old genus Lophyrus and possibly in some lepidopterous pupae. Completing its development in the spring of the year, the maggot issues, forms its puparium, and in about two weeks the adult emerges. There is a second generation, the species being able to develop on a number of hosts. It is the progeny of this generation which hibernate." The eggs are attached to the skin of the host larva, the average duration of the larval stage being 13.9 days and of the pupal stage about 10 days.

"Superparasitism is frequent, as many as seven individuals having been obtained from a single caterpillar. In Europe two species of hyperparasites attacking *S. inconspicua* are known, but none has been recorded from the United States. Competition with other parasites is certain to occur, but because of the rapid development of *S. inconspicua* it will probably not suffer in this respect. In addition to *Porthetria dispar* and *Diprion simile*, *S. inconspicua* has been

reared from many other host species, seven of which are native to the United States."

Endemic typhus fever of the United States, R. E. DYER, E. T. CEDER, A. RUMREICH, and L. F. BADGER (*Jour. Infect. Diseases, 51 (1932), No. 1, pp. 137–161, figs. 15*).—The authors conclude that the oriental rat flea as a vector of endemic typhus meets the requirements of the epidemiologic evidence. The virus of endemic typhus has been recovered repeatedly from rat fleas taken at typhus foci, and finally experimental transmission of the virus from rat to rat by means of rat fleas has been carried out in the laboratory. The evidence points to the rat flea as a common vector of endemic typhus from rat to rat and from rat to man. "The possibility must be borne in mind that rodents may be an important reservoir of typhus in parts of the world where epidemics of typhus occur, and it seems a reasonable hypothesis that epidemics of louse-borne typhus may have their origin from typhus transmitted from rat to man by rat fleas." See also other notes (E. S. R., 66, p. 852; 67, p. 438).

Notes on Utah Coleoptera, G. F. KNOWLTON (*Fla. Ent., 14 (1930), Nos. 2, pp. 36, 37; 3, pp. 53–56; 4, pp. 75–77; 15 (1931), No. 1, p. 10*).—A list arranged by families, is given of the named Coleoptera in the insect collection of the Utah Experiment Station.

Notes on the synonymy, hosts, and distribution of some Buprestidae (Coleoptera), W. J. CHAMBERLIN (*Jour. Econ. Ent., 25 (1932), No. 4, pp. 833–836, fig. 1*).—This contribution from the Oregon Experiment Station consists of brief notes on some 20 species of Buprestidae.

Observations on the sugarcane beetle in Louisiana, J. W. INGRAM and E. K. BYNUM (*Jour. Econ. Ent., 25 (1932), No. 4, pp. 844–849*).—The authors' observations have shown that the sugarcane beetle, the adult of which is a source of injury through its gnawing the underground stem of the young plant, occurs in different places around a plantation, from none in woodlands to more than 100,000 per acre in pasture. Owing to the much greater number of early cane shoots produced by planting sugarcane in the summer rather than in the fall, the former practice affords a much better chance than the latter of producing a crop in the areas where the beetle is a serious problem.

Oak twig pruner (Hypermallus (Ellaphidion) villosum), E. I. MCDANIEL (*Michigan Sta. Quart. Bul., 15 (1932), No. 1, pp. 19, 20, figs. 2*).—This is a brief practical account of *H. villosum*, local infestations of which are general throughout Michigan, the work being conspicuous although the injury is seldom serious.

pH and wireworm incidence, G. A. MAIL (*Jour. Econ. Ent., 25 (1932), No. 4, pp. 836–840*).—A report is presented on the effect of soil acidity or alkalinity on the abundance of wireworms in Montana. "Laboratory experiments show that the larvae of *Limonius canus* can tolerate a much wider range of pH than is commonly found in nature in the agricultural lands of Montana. This is substantiated by field records. The range in pH to which the wireworms were subjected in the laboratory was 4.8 to 8.2. In nature the pH limits in fields studied was 6.1 to 7.7."

The strawberry root-weevil, Brachyrhinus (Otiorhynchus) ovatus, as a conifer pest, E. I. MCDANIEL (*Jour. Econ. Ent., 25 (1932), No. 4, pp. 841–843*).—In this contribution from the Michigan Experiment Station the author concludes that a distinct race of the strawberry root weevil *B. ovatus*, the larvae of which feed only on the root systems of two- and three-year-old conifer seedlings growing in seed beds, has developed.

"The infestation has built up among growing conifers for a quarter of a century or more in a comparatively restricted area. The larvae in the soil

can be killed by the use of carbon disulfide emulsion used at the same strength recommended for the control of the Japanese beetle. The adults can be killed by the use of poisoned bran bait, made according to the same formula recommended for the control of cutworms, except that oil of apples in place of amyl acetate should be used as an attractant. When the three-year-old seedlings are removed from the seed beds in the early spring and transplanted to clean soil the loss will be reduced."

A progress report on feeding tests and spraying and dusting experiments for the control of the plum curculio, O. I. Snapp and J. R. Thomson (*Jour. Econ. Ent., 25 (1932), No. 4, pp. 811–815*).—This is a report of investigations conducted in Georgia in continuation of the work previously noted (E. S. R., 59, p. 62).

"Feeding tests showed potassium fluosilicate at the rate of 2 lbs. to 50 gal. of water to be a little more toxic to the plum curculio (*Conotrachelus nenuphar* Hbst.) than lead arsenate at the rate of 1 lb. to 50 gal. of water. Furthermore, potassium fluosilicate was somewhat more toxic to the plum curculio than barium fluosilicate or cryolite. Wettable sulfur increased the toxicity of fluosilicate as insecticides for the curculio. The toxicity of those insecticides was considerably reduced when they were used at the rate of 0.25 or 0.5 lb. to 50 gal. of water. Calcium monosulfide greatly decreased the toxicity of the potassium fluosilicate, which may have been due to its repellent action. Lead arsenate dusts were not so toxic as the spray. Copper carbonate, wettable sulfur, and zinc sulfate-lime spray, when used alone, were not toxic to the plum curculio.

"Four applications of potassium fluosilicate at the rate of 2 lbs. to 50 gal. with and without wettable sulfur caused no injury to foliage, fruit, or bud wood of peach trees. Four applications of barium fluosilicate or cryolite at the rate of 2 lbs. to 50 gal. of water caused no injury to the foliage, fruit, or bud wood. Four applications of lead arsenate at the rate of 1 lb. to 50 gal. of water with lime burned 2.5 per cent of the fruit and caused moderate to heavy foliage injury with considerable defoliation and occasional bud wood injury. Four applications of lead arsenate of the same strength with zinc-lime spray burned 9.2 per cent of the fruit and caused light to moderate foliage injury with very little defoliation and no bud wood injury.

"Three applications of dust containing 10 per cent lead arsenate caused moderate injury to the foliage with considerable defoliation but no bud wood injury. Three applications of lead arsenate spray at the rate of 1 lb. to 50 gal. of water with lime caused moderate foliage injury but not as much defoliation as the 10 per cent dust and no bud wood injury. There was practically no foliage injury from three applications of dust containing 5 per cent lead arsenate or from three applications of potassium fluosilicate spray."

Sex differentiation of adults of Conotrachelus nenuphar, J. R. Thomson (*Jour. Econ. Ent., 25 (1932), No. 4, pp. 807–810, figs. 4*).—This report of anatomical studies is accompanied by drawings illustrating the structural differences in the two sexes.

Eight years of experimental work in boll weevil control on plots receiving different rates of fertilizer, J. M. Robinson and F. S. Arant (*Jour. Econ. Ent., 25 (1932), No. 4, pp. 759–766*).—In work at the Alabama Experiment Station calcium arsenate controlled the boll weevil on 1/20-acre plats over an 8-year period. Infestation counts were made biweekly, and calcium arsenate was applied when the infestation reached or exceeded 10 per cent. All applications were made during the daytime when the air was relatively calm.

Biennial report of apiary inspection, 1929–1931, F. L. Thomas and C. E. Heard (*Texas Sta. Circ. 64 (1932), pp. 9, fig. 1*).—In this report the operation of the foulbrood law in the State is explained and detailed statistics of the inspection are presented. The 1.41 per cent infection found among the colonies examined is considered to be a remarkably low figure for the territory worked.

The rocking movements of bees, E. C. Alfonsus (*Jour. Econ. Ent., 25 (1932), No. 4, pp. 815–820*).—The author concludes that the rocking movements of young bees are for the purpose of cleansing and polishing the interior of the hive. The same operations are also performed on exterior parts of the hive to provide a clean clustering space. The liking of bees for smooth surfaces seems to cause this mechanical cleansing process.

The temperature relationships of the honeybee cluster under controlled external temperature conditions, C. L. Corkins (*Jour. Econ. Ent., 25 (1932), No. 4, pp. 820–825*).—It has been supposed that as external air temperatures lower following the clustering of the honeybee colony the cluster temperatures rise. Observations for 2,075 hours under controlled temperature conditions show that cluster temperatures remain remarkably constant regardless of external temperatures within certain limits. When there is a significant change in the cluster temperatures, it is in direct relationship with the change in the air temperature rather than inverse.

New methods applied to studies on the sugar content of nectars, O. W. Park (*Jour. Econ. Ent., 25 (1932), No. 4, pp. 826–832, fig. 1*).—This contribution from the Iowa Experiment Station is based upon the studies previously noted (E. S. R., 67, p. 720).

An annotated list of the ants of Mississippi (Hym.), M. R. Smith (*Ent. News, 35 (1924), Nos. 2, pp. 47–54; 3, pp. 77–85; 4, pp. 121–127*).—An annotated list of 76 forms is given.

An additional annotated list of the ants of Mississippi (Hym.: Formicidae), M. R. Smith (*Ent. News, 38 (1927), No. 10, pp. 308–314; 39 (1928), Nos. 8, pp. 242–246; 9, pp. 275–279; 42 (1931), No. 1, pp. 16–24; 43 (1932), No. 6, pp. 157–160*).—This supplementary list contributed from the Mississippi Experiment Station includes descriptions of new species. A total of 135 forms are listed from the State.

Effect of cold storage temperatures on the Argentine ant, F. B. Herbert (*Jour. Econ. Ent., 25 (1932), No. 4, pp. 832, 833*).—In a study made of the mortality of the Argentine ant at various temperatures and periods of time, it was found to succumb in 24 hours if held at a temperature of 31° F., or in a shorter time if held at lower temperatures.

Macrocentrus ancylivorus Roh., an important parasite of the oriental fruit moth, G. J. Haeussler (*Jour. Agr. Research [U. S.], 45 (1932), No. 2, pp. 79–100, figs. 12*).—Studies of the biology of a braconid parasite conducted at Riverton, N. J., in 1926 and 1927, and continued up to the spring of 1929 at Moorestown, are reported. These data supplement the information found in the reports of observations of this species as a parasite of the strawberry leaf roller by Fink (E. S. R., 55, p. 460), as a parasite of the oriental fruit moth by Daniel in New York (E. S. R., 67, p. 441), as a parasite of both the oriental fruit moth and the strawberry leaf roller in New Jersey by Stearns (E. S. R., 60, p. 62), etc.

It is pointed out that this species is closely related to *M. delicatus* Cress., which is parasitic on the same hosts. The oriental fruit moth larvae of all sizes are subject to attack by *M. ancylivorus*, parasitism in the field occurring chiefly in larvae of the early broods which feed in peach twigs. The average

parasitism by this species in fruit worm larvae collected from twigs ranged from 41 to 55 per cent for the four seasons. In 1925 and 1926 collections of larvae which were feeding in twigs during late June and early July showed parasitism by this one species as high as 92 and 84 per cent.

"As many as 40 offspring have been produced by a single female of *M. ancylivorus* under insectary conditions. The transforming parasite larva emerges from the host, on an average, 3 days after the Grapholitha larva would normally have pupated, and feeds on it for 12 to 18 hours. Wintering parasite larvae emerge from the host larvae in the spring and require an average of 2 days for feeding. About 24 hours are required for formation of the parasite cocoon. The combined prepupal and pupal period averages 15.2 days for transforming parasites and 38.5 days for wintering parasites. The average life cycle of transforming and wintering Macrocentrus is, respectively, 5.1 and 31 days shorter than the average life cycle of transforming and wintering Grapholitha.

"Both adult parasites and moths emerge earlier in the spring from larvae which hibernate in outdoor cages than from larvae which hibernate in the insectary. In outdoor cages the spring emergence of the moths occurs considerably earlier than the spring emergence of the parasites."

There were five generations of this parasite in the Riverton-Moorestown area in 1927 and in 1928. Macrocentrus hibernates as a first-stage larva within the full-grown hibernating larva of the oriental fruit moth.

Much of the data is presented in table and chart form.

ANIMAL PRODUCTION

The American Society of Animal Production: Record of proceedings of the twenty-fourth annual meeting, November 27–28, 1931 (*Amer. Soc. Anim. Prod. Proc. 1931, pp. 338, pl. 1, figs. 16*).—This is the report of the annual meeting held at Chicago, November 27 and 28, 1931 (E. S. R., 65, p. 253). The following papers were presented in the nutrition, dairy cattle, beef cattle, horse, sheep and wool, swine, and meats sections:

The Broadened Responsibilities of the Society, by C. W. McCampbell (pp. 9–13; Protein Requirements of Horses, by P. E. Howe (p. 25), of Beef Cattle, by F. W. Christensen (pp. 26–33), of Dairy Cattle, by E. S. Savage (pp. 33–36), and of Sheep, by W. E. Joseph (pp. 37–41); Basal Metabolism and Heat Increments in Growing Farm Animals, by S. Brody (pp. 41–45); Soluble Vitamin Supplements for the Chick, by A. G. Hogan and R. V. Boucher (pp. 45–48); Nutrition Anemia in Ruminants and Swine, by R. B. Becker, W. M. Neal, and A. L. Shealy (pp. 48–51); The Nutritive Requirements of the Dairy Cow Expressed in Accord with a New Method of Application of the Net-Energy Conception, by E. B. Forbes and M. Kriss (pp. 113–120); Mineral Metabolism of the Lactating Cow, by E. B. Hart, G. C. Humphrey, and J. A. Keenan (pp. 120–126); Calcium and Phosphorus Assimilation by Dairy Cows, by H. B. Ellenberger, J. A. Newlander, and C. H. Jones (pp. 126–128); The Relation of the Anterior Pituitary to Lactation, by C. W. Turner, W. U. Gardner, and A. B. Schultze (pp. 128–132); Intra Uterine Development in Cattle, by W. W. Yapp (pp. 133–136); The Rôle of Vitamin D in the Nutrition of the Dairy Calf, by I. W. Rupel, G. Bohstedt, and E. B. Hart (pp. 137–141); Some Disasters in Reproduction and Growth Caused by Low Quality Hay, by H. T. Converse and E. B. Meigs (pp. 141–144); The Use of Cottonseed Meal in Feeding Dairy Cattle, by A. H. Kuhlman, E. Weaver, and W. D. Gallup (pp. 144–149); Heavy Feeding of Cottonseed Meal to Dairy Cattle, by L. A. Moore

and C. F. Huffman (pp. 150–152); Pasture Investigations on the U. S. Animal Husbandry Experiment Farm, Beltsville, Maryland, by A. T. Semple and M. A. Hein (pp. 153–156); Level Terracing for Pasture Lands, by S. W. Greene (pp. 156–159); The Ages of Sires and Dams of Registered Hereford Cattle, by M. D. Lacy (pp. 159–162); Protein and Other Nutrients Required by Fattening Cattle, by W. C. Stiles and F. B. Morrison (pp. 162–167); Individual Feeding in Steer Experimentation, by L. M. Winters and W. H. Peters (pp. 167–171); Frequency of Feeding Steers, by J. G. Fuller, G. Bohstedt, and B. H. Roche (pp. 171, 172); A Feed Lot Test of the Four Most Common Grades of Yearling Feeder Steers, by J. H. Knox (pp. 173–176); Molasses as a Substitute for Corn in Beef Finishing Rations, by F. R. Edwards (pp. 176–178); Molasses in Rations for Fattening Calves, by P. Gerlaugh (pp. 179–182); Molasses-Alfalfa Supplement for Fattening Yearling Cattle, by E. A. Trowbridge and H. C. Moffett (pp. 182, 183); Different Amounts of Cottonseed Meal for Steer Calves, by W. L. Blizzard (p. 184); Color Inheritance in Horses, by E. E. Heizer (pp. 184–192); Blackstrap Molasses for Farm Work Mules, by M. G. Snell and W. G. Taggart (pp. 192–195); Limiting the Grain Ration in Growing Draft Colts, by E. A. Trowbridge and D. W. Chittenden (pp. 196–198); Experimental Work with Horses at Michigan State College, by R. S. Hudson (pp. 198–200); Rolled vs. Whole Oats as a Feed for Draft Colts, by A. B. Caine (pp. 200–204); The Oestrous Cycle in the Sheep, by A. E. Darlow and L. E. Hawkins (pp. 205–207); The Mode of Production of Twins in Sheep, by R. Clark (pp. 207–209); The Relation of Atmospheric Temperature to Water Consumption and Volume of Urine in Sheep, by B. E. Pontius, R. H. Carr, and L. P. Doyle (pp. 210–215); Feeding Potassium Iodide to Pregnant Ewes, by J. A. Schulz, C. C. Culbertson, B. H. Thomas, and J. M. Evvard (pp. 215–219); Factors Related to Weights of Lamb Crops Produced by Grade Fine Wool Ewes, by W. E. Joseph (pp. 219–221); Cottonseed Cake with Grain and Alfalfa for Fattening Lambs, by A. K. Mackey (pp. 221, 222); Sesame Meal vs. Cottonseed Meal and Peanut Meal for Lambs, by R. F. Miller (pp. 223–226); The Comparative Palatability and Feeding Value of Ground Corn and Wheat Self-fed to Lambs, by M. A. Alexander (pp. 226–228); The Effect of the Plane of Nutrition on Wool Growth, by A. D. Weber (pp. 228–230); The Results of Five Years' Work on Castrating Market Lambs, by R. B. Hinman (pp. 234–236); Shedding of Wool by Louisiana Sheep, by M. G. Snell (pp. 236–238); The Present Trend of Wool Research, by J. I. Hardy (pp. 238–241); A Preliminary Comparison of Fleeces from B and C Type Rambouillets, by J. M. Jones, B. L. Warwick, and S. P. Davis (pp. 242, 243); Variation in the Fineness of Duplicate Wool Samples, by B. W. Fairbanks (pp. 244–246); Fleece Analysis in Sheep, by R. H. Burns (pp. 246–258); Progress in the Development of Methods for Determining Degrees of Merit for Sheep and Their Products, by D. A. Spencer (pp. 259–262); Size of Litter as a Selection Index in Swine, by H. C. McPhee (pp. 262–264); Further Observations on Inbred and Outbred Pigs in the Feed Yard, by W. A. Craft (pp. 265, 266); The Effect of Milk Consumption on the Growth of Suckling Pigs, by C. P. Thompson (pp. 266, 267); Individual Feeding Compared with Group Feeding of Pigs, by E. F. Ferrin (pp. 267–270); Utilization of Feed by Swine as Affected by the Level of Intake, by N. R. Ellis and J. H. Zeller (pp. 270–274); Calcium and Phosphorus Content of the Blood of Pigs, by E. H. Hughes and H. Hart (pp. 274–277); The Effect of Fineness of Grinding Corn and Barley on Their Feeding Value for Pigs and Dairy Cattle, by G. Bohstedt, B. H. Roche, J. M. Fargo, I. W. Rupel, and F. W. Duffee (pp. 277–281); Corn and Tankage, an Incomplete Ration for Growing—Fattening Swine, by E. B. Powell (pp. 281–283); Nitrogen Bal-

ance in Hogs Fed Cottonseed Meal, by W. S. Rice (pp. 283–285); Full and Limited Feeding of Pigs on Pasture, by W. L. Robison (pp. 286–289); Soft Pork from the Market Standpoint, by F. M. Simpson (pp. 289–291); Report on Preliminary Comparisons of American, Danish, Irish, Polish, and Swedish Wiltshire Sides, by O. G. Hankins (pp. 291–296); and Cooperative Meat Investigations: Beef Projects, by H. J. Gramlich (pp. 296–299); Pork Projects, by E. H. Hostetler (pp. 300–303); Summary of Results of Cooking Meats, by L. M. Alexander (pp. 303–311); Development of Methods for the Laboratory Study of Meat, by P. E. Howe (pp. 311–315); and The Producer's Attitude, by R. C. Pollock (pp. 315–317).

[Experiments with livestock in Tennessee], M. Jacob (*Tennessee Sta. Rpt. 1931, pp. 23–25*).—Preliminary tests on the value of the addition of molasses to a standard steer-fattening ration and on the maximum amount of grain necessary to feed 2-year-old steers being finished on grass in order to produce the most economical gains are reported. Other studies include data on the use of the emasculatome for docking lambs.

[Experiments with livestock in Utah] (*Utah Sta. Bul. 235 (1932), pp. 43–45, 46, 48*).—This report includes data on breeding for egg production, effect of winter feed and shelter v. open range wintering on the quantity and quality of wool from range ewes, the relative market value of crossbred lambs out of range ewes mated to purebred rams, comparative values of fleeces from types B and C Rambouillet ewes, corn and cottonseed cake as concentrated supplements for wintering sheep on desert ranges, effects on livestock from feeding sugar beets and their by-products, the value of protein supplements and phosphorus-carrying feeds for fattening steers, and protein supplements for fattening swine.

The value of iodine for livestock in central Pennsylvania, E. B. Forbes, G. M. Karns, S. I. Bechdel, P. S. Williams, T. B. Keith, E. W. Callenbach, and R. R. Murphy (*Jour. Agr. Research [U. S.], 45 (1932), No. 2, pp. 111–128*).—In cooperation with the Mellon Institute of Industrial Research, the Pennsylvania State College conducted a series of feeding experiments with dairy cows, calves, swine, lambs, and chickens to determine the value of iodine as a supplement to ordinary rations when fed to farm animals under central Pennsylvania conditions.

A group of 25 grade Holstein cows, infected with or previously exposed to contagious abortion, were fed an average daily dose per head of 1.2 g of elemental iodine. The average feeding period was 28.7 days, but one individual was fed 82.2 g of iodine over a period of 73 days. Agglutination blood tests for abortion disease were made at 2-week intervals. The administration of iodine did not affect the development of the abortion disease nor change the reaction of infected cows. Iodine feeding during the last 6 months of pregnancy was not harmful. The milk and cream produced during heavy iodine feeding had an objectionable odor and contained large quantities of iodine.

Iodine was fed for 75 to 139 days in the form of iodized linseed meal to one calf in each of 21 pairs in amounts ranging from 10 to 23.5 mg of iodine per day. Calves were not able to tolerate 30 mg of iodine per 100 lbs. of live weight as shown by loss of appetite, roughness of hair, digestive disturbances, and emaciated condition after receiving this amount from 3 to 5 weeks. They could generally tolerate 10 mg of iodine with no harmful effects. Calves receiving iodine ate less hay, made less gain in weight but greater gain in height than those receiving no iodine. Adding cod-liver oil to the ration of calves emaciated as a result of excessive iodine feeding was helpful in bringing them back to normal.

Among 10 experimental lots of 4 pigs each, fed as matched pairs for 126 days, the differences in gains in weight of the check lots and the lots receiving iodine in the form of iodized linseed meal were not significant. The five lots receiving iodine required 401.3 lbs. of feed to produce 100 lbs. of gain, while the check lots required 407.9 lbs. of feed for the same gain.

One lamb in each of 15 pairs of native Pennsylvania lambs received in addition to their ration 33 mg of iodine per day for 77 days in the form of iodized linseed meal. The average difference in average daily gains of pair mates was 0.01 lb. in favor of the check lamb. The average daily gains of lambs in groups fed iodine were slightly less than those in the check lots. The feed required per 100 lbs. of gain with native fine wool, native mutton, and western lambs, fed in 6 lots of 28 or 29 head each was 184.5, 136.4, and 46.9 lbs. more in the lots receiving iodine than in the respective check lots.

White Leghorn pullets were fed in four lots of from 160 to 187 birds each from hatching time to 32 weeks of age. In two lots the chicks received a normal ration containing fish meal, while in the other lots meat scrap replaced the fish meal. Iodine was fed in the form of iodized linseed meal to one lot of each series at a rate supplying 50 mg of iodine per 100 lbs. of chicken daily. The iodine had no definite effect on growth, mortality, or egg production of the birds.

Marketing grains and roughages through livestock, G. A. Brown, G. A. Branaman, and V. A. Freeman (*Michigan Sta. Quart. Bul., 15 (1932), No. 1, pp. 3–6*).—The returns made from grains and roughages when marketed in the form of pork, beef, or mutton are discussed in this article.

Commercial feeds in Kentucky in 1931, J. D. Turner, H. D. Spears, W. G. Terrell, and L. V. Amburgey (*Kentucky Sta. Bul. 330 (1932), pp. 173–214*).—This bulletin contains the usual summary of results of inspection and analysis of feeds sold in Kentucky during 1931 (E. S. R., 66, p. 58).

Ninth annual report [of the] National Live Stock and Meat Board [1931–32], R. C. Pollock (*Natl. Livestock and Meat Bd. Ann. Rpt., 9 (1932), pp. 132, figs. 119*).—This report (E. S. R., 61, p. 664) contains brief accounts of studies on the quality and palatability of meat, the value in the diet of certain constituents of lard, and the effects of diet, especially high protein diets, on the kidneys. Brief reports are also made of publicity contests and information on meat disseminated during the year.

International livestock atlas.—I, International cattle atlas: Germany, Hungary, Netherlands, Switzerland (*Atlas International Zootechnique.—I, Atlas International des Bovins: Allemagne, Hongrie, Pays-Bas, Suisse. Roma: Inst. Internatl. Agr., 1930, vol. 1, [pts. 1–4], pp. 63, figs. 21; pp. 56, pl. 1, figs. 11; pp. 45, pl. 1, figs. 14; pp. 49, pl. 1, figs. 12*).—The last sentence of the abstract of this treatise (E. S. R., 65, p. 660) should read "The text is in French and English as well as in the language of the country dealt with."

The effect of the amount of feed consumed by cattle on the utilization of its energy content, H. H. Mitchell, T. S. Hamilton, F. J. McClure, W. T. Haines, J. R. Beadles, and H. P. Morris (*Jour. Agr. Research [U. S.], 45 (1932), No. 3, pp. 163–191, figs. 5*).—The purpose of this study at the Illinois Experiment Station was to determine the effect of the amount of feed consumed upon the utilization of its energy. A grade Shorthorn steer, approximately 2 years old, was fed a ration which, on a dry matter basis, averaged 73.1 per cent of ground corn, 24.1 per cent of alfalfa hay, 2 per cent of linseed meal, and 0.8 per cent of molasses. During five experimental periods observations were made on the digestibility and energy utilization of this ration at levels of full feed, four-fifths, three-fifths, two-fifths, and one-fifth feed. The fasting

metabolism was determined in two additional periods. Each experimental period consisted of at least a 7-day preliminary feeding period, a period of from 10 to 12 days during which feces and urine were collected for analysis, and 3 days, consecutive or intermittent, in the respiration chamber.

The lowest level of feeding was associated with the most complete digestibility of all nutrients, but there was a progressive decrease in digestibility from the lowest to the highest ration only in the case of nitrogen-free extract, ether extract, and dry matter. The metabolizable energy of the ration per kilogram of dry matter increased progressively from 2,661 Calories for the highest to 3,094 Calories for the lowest level of feeding. The percentage metabolizability of the gross energy likewise decreased from 60.6 to 70.1. However, when the metabolizable energy was computed to a kilogram of digestible nutrients, the effect of the level of feeding disappeared. The average daily respiratory quotients for the five levels of feeding in the order of decreasing levels were 1.13, 1.12, 1.05, 0.97, and 0.88. The average fasting heat production, corrected to a standard day of 12 hours' standing and 12 hours' lying, averaged 1,858 Calories per square meter of body surface as determined with the Brody surface integrator (E. S. R., 56, p. 161). If, however, the surface area was calculated by the Moulton formula (E. S. R., 35, p. 64), the fasting production was 1,554 Calories per square meter of body surface.

There was no evidence that the preceding feeding affects appreciably the heat production of the fourth, fifth, and sixth days of fast. The heat increment due to feeding, per kilogram of dry matter consumed, increased from the lowest to the highest levels of feeding, while the net energy values decreased progressively from 2,957 to 1,842 Calories. The percentage availability of metabolizable energy assumed the following values from the lowest to the highest levels of feeding: 95.6, 77.7, 75.2, 73.8, and 69.3. This decrease in total utilization of feed appeared to be due in part to a more or less continuous decrease in digestibility and also to a slight specific dynamic effect of feed at the very low levels.

From these results it appears that, except for submaintenance levels of feeding, the net energy value of a ration bears a linear relation to the amount of dry matter consumed. There was some evidence to indicate that size of animal may eventually have to be considered in defining this relation.

Beef cattle investigations, 1931–32 (*Kansas Sta., Fort Hays Substa., Beef Cattle Invest., 1931–32, pp. 8*).—The results of four tests, in continuation of those previously reported (E. S. R., 66, p. 355), are noted.

Cottonseed cake v. grain as supplemental feeds.—In this test five lots of 10 calves each, averaging approximately 430 lbs. per head, were fed for 150 days. All lots received an average daily feed of 31 lbs. of Atlas sorgo silage per head and in addition the respective lots received 1 lb. of cottonseed cake or 2 lbs. of ground kafir, ground milo, ground barley, or ground wheat. The average daily gains were 0.9, 0.8, 0.8, 0.9, and 0.9 lb. per head, respectively. On a pound to pound basis, 1 lb. of ground wheat was worth 53 per cent, 1 lb. of ground barley 52, 1 lb. of ground kafir 46.5, and 1 lb. of ground milo 45 per cent as much as 1 lb. of cottonseed cake as supplements to Atlas sorgo silage. In comparing the grains, ground milo was worth 85 per cent, ground kafir 87 per cent, and ground barley 94 per cent as much as ground wheat.

Atlas sorgo silage and ground wheat v. kafir hay and ground wheat as winter rations for stock calves.—Calves averaging 431 lbs. per head were divided into two lots of 10 head each and were fed for 150 days. One lot received Atlas sorgo silage and ground wheat and the other lot kafir hay and ground wheat. The average daily gains were 0.9 and 0.6 lb. per head, respectively. Both

rations were satisfactory for wintering stock calves. The gains per ton of feed consumed were greater in the lot fed kafir hay since the hay contained about twice as much dry matter as the silage, but the silage yielded about twice as much tonnage per acre as the hay.

The comparative value of carried over cane hay and carried over kafir hay as the basis of winter rations for stock cattle.—Two lots of 10 head each, averaging 702.7 lbs. per head, were fed for 150 days on either cane or kafir hay that had been carried over from the previous year. The lots received an average of 31 lbs. of hay per head daily supplemented with 1 lb. of cottonseed cake. The average daily gains were 1.2 and 0.8 lb. per head in the lots receiving cane and kafir hay, respectively. These results showed that such hays were better feeds than is commonly supposed, and that cane hay lost less of its feeding value over long periods of storage and exposure than kafir hay.

The comparative value of Atlas sorgo silage and Pink kafir silage.—In this test two lots of 10 head each, averaging 702.5 lbs. per head, were fed for 150 days. One lot received Atlas sorgo silage and the other lot Pink kafir silage, while cottonseed cake was used as a supplement in both lots. The Atlas silage was not of good quality, and the cattle fed in this lot were not as good as those in the other lot. The average daily gains in the respective lots were 1.1 and 1.7 lbs. per head. The lot receiving Atlas silage made 56 per cent more gain per acre than the lot receiving Pink kafir. The Atlas sorgo yielded 8.4 tons of silage per acre, while Pink kafir yielded 3.6 tons.

Prolificacy of sheep: Records of a small breeding flock, J. F. H. Thomas (*Jour. Min. Agr. [Gt. Brit.], 39 (1932), No. 3, pp. 193–196*).—A record covering a period of 5 years was kept on the breeding flock of sheep at the Royal Agricultural College, Cirencester, covering prenatal and postnatal death rates. Feeding suitable concentrate feeds and limiting the amount of hay fed before lambing were thought to be responsible for the average raising of 1.7 lambs per ewe mated. Prenatal and postnatal losses of triplet lambs amounted to about 24 per cent of the total conceived, while similar losses for twin lambs were 9 per cent. The prenatal and postnatal losses for all lambs were practically equal.

Fattening western lambs, 1929–1930, 1930–1931, 1931–1932, F. G. King and C. Harper (*Indiana Sta. Bul. 360 (1932), pp. 20, fig. 1*).—Continuing this series of studies (E. S. R., 63, p. 659) in cooperation with the U. S. D. A. Bureau of Animal Industry, nine lots of 25 lambs each were fed different rations. Tests were conducted during three different years with lambs averaging 63, 67, and 69 lbs. initial weight for periods of 100, 90, and 80 days, respectively. Corn silage and clover hay were fed in such quantities as the lambs would readily consume in all lots, while cottonseed meal was fed in lots 1, 2, 3, 6, 7, and 8. In addition the respective lots received fine-ground oats, medium ground oats, coarse-ground oats, shelled corn, whole oats, equal parts of shelled corn and whole oats, shelled corn, whole oats, and no supplement.

Whole oats were equal to shelled corn for fattening lambs when fed with cottonseed meal, corn silage, and clover hay, but corn fed without cottonseed meal produced a better market finish and more profit when compared with unsupplemented whole oats. Cottonseed meal as a supplement to whole oats, silage, and hay increased the rate and reduced the cost of gains and improved the market finish. The consumption of feed, rate of gain, market finish, and financial returns were all greatly reduced when ground oats were fed instead of whole oats. Some lambs developed urinary calculi when fed ground oats. Whole oats produced somewhat larger gains than either shelled corn or a combination of corn and oats. The lambs on the ration of corn silage and clover hay made unsatisfactory gains.

Digestibility and production coefficients of hog feeds, G. S. Fraps (*Texas Sta. Bul. 454 (1932), pp. 24*).—The coefficients of digestibility are reported in this bulletin for 153 digestion experiments with hogs or pigs, 14 of which are reported for the first time from the station and 54 of which are from German sources.

Pigs as a rule had lower digestive powers than ruminants but higher than poultry. With many concentrates pigs had as high digestive powers as ruminants, but their ability to digest crude fiber and fibrous feeds was low. It is believed that pigs utilized a larger percentage of the net energy over maintenance for fattening than other animals, but the extent of this difference was not known. Tentative production coefficients are given which may be used for making estimates of the productive energy of corresponding pig feeds of known chemical composition. The average composition of a number of pig feeds is given, together with their productive energy and digestible protein calculated by use of the production coefficients. Tentative standards for feeding pigs for use in connection with productive values are presented.

Minerals in relation to pig-feeding, C. Crowther and T. S. Wright (*Jour. Min. Agr. [Gt. Brit.], 39 (1932), No. 3, pp. 201–207*).—In two tests at the Harper Adams Agricultural College, Salop, England, it was found that the only mineral supplements needed by pigs on a ration of cereals, wheat offals, and soybean meal were lime and salt. As a result of these tests a standard mineral supplement composed of two parts of limestone flour and one part of common salt was recommended, but there were some indications that a smaller allowance of salt would be sufficient.

Investigations on the effect of ferric sulfate on anemia of small pigs [trans. title], N. E. Olofsson (*K. Landtbr. Akad. Handl. och Tidskr., 71 (1932), No. 3, pp. 312–347, figs. 3; Eng. abs., pp. 344–346*).—Based partly on a study previously noted (E. S. R., 67, p. 60), a series of tests was undertaken at Svalöf, Sweden, to determine the effect of ferric sulfate in preventing anemia of pigs. A group of nine litters was used, five of which received from 0.5 to 1 g of the iron compound daily for a period of eight weeks.

The growth per pig and per day in the litters receiving iron exceeded that of the pigs in the control litters. During the fourth and fifth weeks the hemoglobin level of the blood in the test litters was about twice as high as in the controls. The percentage of mortality was considerably higher in the control litters than in those receiving iron. It is pointed out that feeding iron to pigs is especially important where conditions are such that pigs must be kept indoors and where they receive no green feed.

Factors influencing the dressing percentage of hogs, G. F. Henning and W. B. Stout (*Ohio Sta. Bul. 505 (1932), pp. 32, figs. 6*).—This study is based on data obtained from tattooed hogs from 7 cooperative associations, on records on 437 carloads of hogs shipped to 1 slaughterer, and on records of Federal inspected slaughter for the years 1923–1930.

It was found that production factors had but little influence on the yield of hogs. Of the marketing factors, shrink and yield had an inverse relation; the same was true of the number of days between time of shipment and time of slaughter; live weight affected yields but slightly; and yield had a distinct seasonal variation throughout the 12 months.

Liberal v. limited rations in raising weanling draft colts, R. S. Hudson (*Michigan Sta. Quart. Bul., 15 (1932), No. 1, pp. 16–18, fig. 1*).—Weanling draft colts were divided into three lots of eight head each and were fed as follows for 120 days: Lot 1, equal parts by weight of ear corn and whole oats at the rate of about 2 lbs. per 100 lbs. live weight with all the alfalfa-mixed hay and oat straw they would eat; lot 2, the same as lot 1, but one-half the amount of

grain; and lot 3, one-fourth as much grain as lot 1 and hay limited to 1 lb. per 100 lbs. live weight. Block salt was kept before all lots, and each lot had 4.4 acres of pasture for exercise.

The average daily gains in the respective lots were 2.4, 1.6, and 1.2 lbs. per head. The feed cost per colt per day was 14, 10, and 7 cts. in the respective lots. The colts in lot 2 consumed much more roughage and half as much grain as those in lot 1, but in spite of this the gains in weights and measurements were practically as satisfactory as those in lot 1.

Draft horses, J. C. Steckley and M. W. Staples (*Ontario Dept. Agr. Bul. 365 (1932), pp. 36, figs. 41*).—This is a popular publication dealing with the breeds of draft horses, the feeding, breeding, management, and unsoundness of horses, and suggestions on the use of the multiple horse hitches.

Blackstrap molasses for farm work mules, M. G. Snell and W. G. Taggart (*Louisiana Stas. Bul. 230 (1932), pp. 16, fig. 1*).—Continuing this study (E. S. R., 63, p. 364), it was found that blackstrap molasses was equal to corn as a feed for work mules. The molasses increased the appetite of the mules for other feeds. The maximum amount of molasses that could be fed with good results appeared to be 9 lbs. A heavy feeding of molasses apparently increased sweating and "winding" of mules, particularly during the hot months of the year.

A combination of blackstrap molasses, ground whole ear corn, and alfalfa or soybean hay made a very satisfactory ration for work mules. It was found preferable to feed the molasses fresh, especially when 6 or more pounds were used, since moist molasses feeds were apt to ferment and cause digestive disturbances. Unlike the results obtained with cattle, molasses had a more or less constant feeding value for mules.

It is recommended that mules be treated twice yearly for worms.

The utilization of feed by chickens.—I, The requirements for growth, W. A. Hendricks, M. A. Jull, and H. W. Titus (*Poultry Sci., 11 (1932), No. 2, pp. 74–77*).—In this study by the U. S. D. A. Bureau of Animal Industry, data are presented to show that the curve of diminishing increment may be of value in determining the suitability of a given feed mixture for promoting growth in chicks. The degree of utilization of that fraction of the feed intake remaining for growth after the other requirements of the body have been satisfied appeared to be independent of the level of nutrition at which the diet was fed, if the level was held at an approximately constant percentage of ordinary ad libitum feed consumption.

One lot of crossbred cockerel chicks and a similar lot of pullets were fed a ration complete in all known nutritional factors. The remaining six lots of chicks of each sex received, respectively, 87.5, 75, 62.5, 50, 37.5, and 25 per cent of the amount of feed which chicks of the same age might be expected to consume when fed ad libitum. It was found that the diet was capable of producing about 0.35 g of body tissue for each gram of feed eaten, if no feed had been required for other metabolic processes. The sex of the chicks had no effect upon the efficiency of the ration. The maximum live weight attainable appeared to be roughly proportional to the level of nutrition on which the chicks were reared.

The growth promoting values of dried buttermilk, dried skimmilk, and dried whey for chicks, F. E. Mussehl and C. W. Ackerson (*Poultry Sci., 11 (1932), No. 2, pp. 69–73, figs. 2*).—The data obtained in studies with chicks at the Nebraska Experiment Station did not indicate a superior growth-promoting power of the nutrients of dried whey as compared with dried buttermilk, when fed on an equivalent protein basis. Dried buttermilk, on the other hand, had a significantly better growth-promoting value than dried skim milk. The

basal rations used in these tests contained adequate amounts of minerals and vitamins, so it was felt that possibly the difference in the lactic acid content of the dried buttermilk and dried skim milk might be responsible for the difference in growth. However, the physiological effect of lactic acid is not known, and further study is suggested by these observations.

Can the chick balance its ration? E. M. Funk (*Poultry Sci., 11 (1932), No. 2, pp. 94–97*).—In this study at the Missouri Experiment Station feed was placed before chicks as soon as they were hatched. Each ingredient of the ration was put in a separate feeder so that the chicks had free choice of feed at all times. The hoppers were moved twice daily to prevent the location of the feeder from long influencing feed consumption. This method of feeding was checked with the usual plan of feeding chicks.

The chicks selected a balanced ration which closely resembled that recommended by the station when the necessary ingredients were available to them. During the first eight weeks they selected a very uniform ration, indicating that the physiological requirements for protein, energy, minerals, etc., are quite uniform during this period. Normal growth, bone development, and feathering were obtained in the free-choice lot. As they increased in size, the chicks ate only small quantities of salt and alfalfa leaf meal and reduced their consumption of bran and increased that of corn meal, shorts, and bone meal.

Perosis, or deforming leg weakness, in the chicken, H. W. Titus (*Poultry Sci., 11 (1932), No. 2, pp. 117–125*).—In a series of eight experiments by the U. S. D. A. Bureau of Animal Industry, between 42.5 and 85 per cent of the chicks observed developed perosis on the ration used for studying this disorder.

In the first four tests negative results were obtaind by the addition of vitamin A and D supplements or inorganic salts. In the last four tests rice bran was fed at different levels and in rations with varying calcium-phosphorus ratios. The results showed that the addition of rice bran supplied something which was quite effective in decreasing the percentage of cases of perosis, even when the calcium-phosphorus ratio was relatively narrow. In some cases when rice bran was added to a ration having an optimum calcium-phosphorus ratio no perosis occurred. The active factor of the rice bran could not be extracted with ether, and in the absence of cod-liver oil the rice bran was not effective in preventing rickets. The author believes that the factor of rice bran associated with prevention of perosis may possibly belong to the vitamin B complex group.

Constancy of specific rotation with age in natural egg white, W. F. Holst and H. J. Almquist (*Poultry Sci., 11 (1932), No. 2, pp. 81, 82*).—The specific rotation of the white was determined in a number of eggs of varied characteristics and storage treatments by the California Experiment Station in an effort to determine a significant change. The eggs varied in age from 1 to 207 days and represented all stages of thick white liquefaction from normal fresh condition to complete conversion into thin white.

No significant change was apparent, indicating that the alterations in normal stored eggs do not involve appreciable decomposition.

A critical review of the literature on the coloring matter in egg yolk, M. Mattikow (*Poultry Sci., 11 (1932), No. 2, pp. 83–93*).—In this article the author reviews the literature relating to the coloring matter of egg yolk, and suggests further researches to determine whether there is any relationship between the color and vitamin properties of egg yolk.

A comparison of feeding a twelve percent and a nineteen percent protein ration to White Pekin ducklings, D. H. Horton (*Poultry Sci., 11 (1932),*

No. 2, pp. 106–109).—This test was undertaken to compare rations containing 12.2 and 19.2 per cent of protein for growing White Pekin ducklings. The low protein ration received enough mineral supplement to bring the ash content of the ration to 11.7 per cent, while in the high protein lot 10 per cent of flour was added.

Both rations produced satisfactory growth when fed from the time the ducklings were brooded until they were marketed. However, on the low protein ration the total feed consumption and the cost of feed were greater, while the return over feed cost was less than in the high protein lot. The high level of mineral feeding in the low protein lot produced no apparent harmful effects.

DAIRY FARMING—DAIRYING

The Hannah Dairy Research Institute report for the two years ending 31st March, 1932 (*Hannah Dairy Research Inst. Rpt., 2–3 (1931–1932), pp. 16, pls. 4*).—This is a summary of the research work with dairy cattle and dairy products that is being conducted at this institution.

Experiments with alfalfa as pasture for dairy cows, A. B. Dorrance and H. C. Rather (*Michigan Sta. Quart. Bul., 15 (1932), No. 1, pp. 30–34*).—A field of Grimm alfalfa was divided into four 2-acre plats and handled as follows: Plat 1, pastured continuously or so long as pasture was available; plat 2, first cutting pastured, second cutting harvested for hay; plat 3, first cutting harvested for hay, second cutting pastured; and plat 4, harvested for hay.

The attempt to obtain continuous grazing throughout the season with three cows on plat 1 was not successful because limiting the number of cows permitted the alfalfa to mature and become woody. On plat 2 the three original cows could not keep the pasture down and an additional three cows were turned on this plat. Plats 3 and 4 produced a good crop of hay at the first cutting, but dry weather made second cutting growth very short in all plats.

The return per acre, based on the cash value of the hay plus the value of milk produced on pasture less cost of grain fed while the cows were on pasture, was $20.63, $26.40, $25.69, and $15.61, respectively.

Mint hay versus alfalfa hay for milk production, G. E. Taylor and E. L. Anthony (*Michigan Sta. Quart. Bul., 15 (1932), No. 1, pp. 25–27*).—Using the double reversal method, two lots of two cows each were fed through three 30-day periods preceded by 3-day preliminary periods. All animals received the same grain and silage ration and either ground alfalfa or ground peppermint hay at the rate of 1 lb. per 100 lbs. live weight.

On a 4 per cent corrected basis the cows produced 11.5 lbs. more milk on mint hay than on alfalfa. The difference was too slight to do more than indicate that the two hays are practically equal for milk production. The cows gained 115 lbs. in weight on alfalfa and 53 lbs. on mint hay. The milk produced on alfalfa scored 1.5 points higher for flavor than did that produced on mint hay, and the same relationship was found to exist in both the cream and butter. No off flavor was found in these products that was suggestive of mint. The mint hay was less palatable and slightly more laxative than the alfalfa hay.

Sunflower silage versus rutabagas in the ration of lactating dairy cows, R. E. Horwood and G. W. Putnam (*Michigan Sta. Quart. Bul., 15 (1932), No. 1, pp. 27–29*).—In this test two lots of three cows each were fed by the double reversal method through three periods of 30 days each on the same hay and grain ration. In addition the lots received either sunflower silage or rutabagas fed in equal amounts on a dry matter basis.

The differences in weight gains and in milk and butterfat production while on the two feeds were not considered significant. It was concluded, therefore, that when fed on an equivalent dry matter basis there is no difference between sunflower silage and rutabagas when used as the succulent portion of the ration for milking cows.

[Dried molasses beet pulp] (*Utah Sta. Bul. 235 (1932), p. 48*).—Preliminary results are reported of a study on the value of dried molasses beet pulp when added to a grain mixture for milking cows.

Utilization of calcium and phosphorus by dairy heifers, high and low calcium roughages, O. C. Cunningham, L. H. Addington, and W. E. Watkins (*New Mexico Sta. Bul. 206 (1932), pp. 18, fig. 1*).—This study was started with four lots of five Holstein heifer calves each. The animals were fed individually and had free access to salt and water. Lots 1 and 2 were fed alfalfa hay and corn silage; lot 3, cane hay and corn silage; and lot 4, cane hay. Lot 1 also received wheat bran and linseed meal, while cottonseed meal was fed in the remaining lots. All lots received mixed corn, and whole milk or skim milk was fed in varying amounts and durations.

While only one animal showed symptoms that might be considered as typical cottonseed meal injury, every animal began to gnaw wood at a few months of age. Serious breeding troubles were also encountered.

In order to determine whether the animals were suffering from a deficiency of phosphorus, 19 heifers were used in 20 metabolism trials. Eight of the heifers were placed on metabolism tests before they had freshened, five while in high milk production, and seven while in medium or low production.

The results did not indicate that the phosphorus intake was low enough to account for the gnawing of wood and the difficult breeding of cattle. The lower calcium intake of the heifers on cane hay rations was balanced by the higher percentage utilization of calcium. There were no material differences in the utilization of phosphorus by the heifers receiving alfalfa or cane hay.

Normal growth of dairy cattle, S. Bartlett and J. L. Jameson (*Jour. Dairy Research [London], 3 (1932), No. 2, pp. 310–316, figs. 3*).—The normal curves for growth of dairy Shorthorn cattle from birth to 5 years of age, as obtained over a period of 10 years at the University of Reading, are presented. These data include height at withers, length of body, depth of chest, and live weight.

Reproduction and health records of the Beltsville herd of the Bureau of Dairy Industry, F. W. Miller and R. R. Graves (*U. S. Dept. Agr., Tech Bul. 321 (1932), pp. 24, fig. 1*).—The reproduction and disease records of the herd of dairy cattle maintained at the U. S. D. A. Animal Husbandry Experiment Farm, Beltsville, Md., are presented in this publication. The herd consisted of purebred Holsteins and Jerseys and grades of the two breeds and was maintained for conducting studies in breeding, feeding, and management of dairy cattle.

There was little difference in the breeding efficiency between abortion-negative and abortion-positive animals over a 4-year period. More services were required per conception in abortion-positive animals than in abortion-negative animals. About 40 per cent of the conceptions resulted from the first service, and a little more than 70 per cent from the first three services. More services were required per conception following abortion than following normal calvings. More of the mature cows than of the immature cows became sterile. During the months of July, August, and September more services were required per conception than in other months of the year. The percentage of live calves born in the abortion-negative group was higher than in the abor-

tion-positive group, but the abortion rate decreased in the abortion-positive group following separation from the regular herd. More abortions were found among the first pregnancies of the abortion-positive females than among the later pregnancies.

The removal of persistent corpora lutea in cows failing to come into heat was usually followed by oestrum and successful breeding. Treatment of ovarian cysts were unsuccessful in most cases where nymphomaniac symptoms were present. Forced exercise was beneficial in cases lacking muscular tone. Data are presented showing the number of services before and after sprouted oats were fed to cows that would not conceive.

Heredity and milking function, A. C. T. Hewitt (*Jour. Dairy Research [London], 3 (1932), No. 2. pp. 272–280*).—Continuing this study (E. S. R., 55, p. 772), the department of agriculture of Victoria found the correlation coefficients between mothers and daughters of the Red Polled breed in regard to total milk yield, butterfat percentage, and total butterfat to be 0.321±0.049, 0.388±0.046, and 0.316±0.049, respectively. These data are based on the average production of 217 cows varying in age from 2 to 14 years.

The influence of paternal and maternal grandmothers and the methods of breeding on the inheritance of these factors are discussed.

Breeding for milk production in the Tropics, J. Edwards (*Jour. Dairy Research [London], 3 (1932), No. 2, pp. 281–293, pl. 1, figs. 2*).—The material for this study by the Animal Nutrition Institute, Cambridge University, consisted of the milk records and pedigrees of the dairy herd at the government stock farms at Kingston, Jamaica.

Cattle of European blood had a low average yield and a high percentage of constitutional failures. The same was true of half-blood zebu cattle. The higher average yields in the grades carrying one-thirty-second and one-fourth zebu blood, together with the lower percentage of failures in these grades, indicated the possibility of using them as a medium for development of a new breed suited to the environment.

Dairy progress as shown by dairy herd improvement associations, A. C. Baltzer (*Michigan Sta. Quart. Bul., 15 (1932), No. 1, pp. 38–40*),—A study of the average butterfat production of cows that had been on test for 12 months in dairy herd improvement associations of the State showed that animals producing less than 250 lbs. of fat per year did not pay for labor, management, and overhead costs.

The yield and composition of milk with special reference to the influence of climatic conditions and other factors, J. Houston and R. W. Hale (*Jour. Dairy Research [London], 3 (1932), No. 2, pp. 294–309*).—Preliminary results of a study of some causes of variations in the yield and composition of milk at the Agricultural Research Institute of Northern Ireland are reported in this paper. This particular phase dealt with the influence of the season of the year and of climatic conditions. In studies with temperature the average temperature for the period between milkings was used.

It was found that butterfat yield was more variable than either milk yield or solids-not-fat yield, that variations in butterfat percentage were due chiefly to variations in milk yield, that the morning percentage of butterfat varied more than the evening percentage, and that butterfat percentage and solids-not-fat percentage did not vary together. The season of the year was found to exert a marked influence on the percentage of solids-not-fat, the summer period depressing this yield. The season had a comparatively small effect on the percentage of butterfat and had more effect upon morning percentage of butterfat than upon evening percentage. Daily variations in milk and solids-not-fat

yields were independent of temperature changes. Daily variations in temperature affected the morning percentage of butterfat but not the evening, and also the morning and evening percentages of solids-not-fat.

The influence of non-stripping on the bacterial count of machine-drawn milk, G. C. Wallis, C. H. Eckles, W. E. Petersen, and H. Macy (*Jour. Dairy Sci., 15 (1932), No. 2, pp. 163–170, figs. 2*).—In the first part of this test at the Minnesota Experiment Station a milking machine was stopped after approximately one-half of the milk was obtained from 6 cows, and a sample of milk was drawn separately from each quarter by hand under aseptic conditions. In a preliminary 2-day period stripping was practiced regularly followed by 2 days in which stripping was discontinued, and by 2 more days when stripping was again practiced. In the second part of the test, 2 cows were milked with a specially sterilized milking machine and a sample of the entire amount of milk was taken. During the 6-day trial the teats of each animal were sealed with collodion between milkings to prevent a variable contamination. Stripping in this test was practiced as noted above. The milk samples were plated in duplicate in at least 2, and usually 3, dilutions of beef infusion agar. The plates were incubated for 2 days at 37° C. and then counted.

No positive evidence was found to show that leaving strippings in the udder increased the bacterial count of subsequent milkings. The counts of the different quarters were independent of each other. There was no correlation between the thoroughness of machine milking and the normal bacterial count of aseptically drawn milk. The effect of nonstripping on bacterial count was negative with cows that milked out poorly as well as with those that milked out well with a machine. The same was true for cows that were of either the normally high or low count type. Sealing the teats with collodion did not have a noticeable effect on reducing counts or preventing relatively wide fluctuations.

The efficiency of the milking machine, R. Phillips and S. B. Thomas (*Welsh Jour. Agr., 7 (1931), pp. 277–290, fig. 1*).—In this article from the University College, Aberystwyth, the advantages and disadvantages of milking machines and the cost of operation are discussed, and a comparison is made of their bacteriological efficiency as compared to hand-milking.

The use of water bowls in the dairy barn, C. Y. Cannon, E. N. Hansen, and J. R. O'Neal (*Iowa Sta. Bul. 292 (1932), pp. 101–114, figs. 2*).—Continuing this study (E. S. R., 65, p. 169), the double reversal method, consisting of four periods of 28 days each, preceded by 7-day preliminary periods, was used on two lots of six cows each. During an experimental period one lot was watered by means of drinking cups, while the other lot was watered at a tank outside the barn.

When drinking cups were used the cows drank approximately 18 per cent more water and produced 3.5 per cent more milk and 10.7 per cent more butterfat than when watered twice a day at an outside tank. The cows drank about 10 times per day from the drinking cups, consuming about two-thirds of this water between 5 a. m. and 5 p. m. Cows watered at the outside tank frequently drank but once a day, and while this refusal to drink more often was distributed among all the cows certain ones showed a greater disposition to drink but once than others. There was no consistent correlation between an inclination to drink and the quantity of milk yielded. A mathematical treatment of the data showed that the probability of the fact that the cows watered with drinking cups produced richer milk was due to chance was about 4 in 100. The temperature of the water did not influence its consumption so much as did atmospheric temperature.

Color in milk as affecting its marketability, H. A. Ruehe and H. K. Wilson (*Milk Dealer, 21 (1932), No. 11, pp. 37–39, figs. 6*).—In this study at the Illinois Experiment Station an attempt was made to establish the relation of certain factors to the blue color of skim milk. Color determinations were made by means of the Keuffel and Esser color analyzer.

Pasteurizing milk for 30 minutes at 140° F. tended to develop a maximum blue color in the skim milk, while temperatures of from 143° to 145° tended to cause a more nearly white appearance without injuring the cream line excessively. During periods of digestive disturbances, the cows produced milk which had a tendency to appear blue in samples containing as much as 1 per cent of fat. Adding water gave skim milk a bluish appearance. There were indications of a relation between the feed consumed and the color of the skim milk, but this fact was not fully demonstrated.

The influence of the fat content on the keeping quality of milk, S. B. Thomas and H. Jones (*Welsh Jour. Agr., 7 (1931), pp. 304–310, figs. 3*).—Based on the results of 18 county clean milk competitions, on 30 local authority milk surveys, and on milk tests at University College, Aberystwyth, a marked tendency was found for milk with a high fat content to have better keeping qualities than milk of a lower fat content.

Seasonal variations in the bacterial content and keeping quality of milk, S. B. Thomas (*Welsh Jour. Agr., 7 (1931), pp. 310–318, figs. 4*).—The data used in this study at University College, Aberystwyth, were collected from the routine examination of milk samples conducted over a 6-year period.

It was found that average monthly milk temperatures were much higher than the air temperatures during winter and autumn, but the difference was considerably less during the warm months. There was an appreciable difference in the arrival temperatures of morning and evening milk during July and August, and this factor had a marked effect on keeping quality. The majority of samples taken during the winter and early spring had a bacterial count under 30,000 per cubic centimeter, while the reverse was true during the summer period. Evening milk had a longer average keeping period than morning milk during the months of June, July, August, and September, but the average length of this period was depressed by the higher night temperatures during July and August.

A temperature treatment for increasing the viscosity of sweet cream, J. C. Hening and A. C. Dahlberg (*New York State Sta. Tech. Bul. 197 (1932), pp. 18, figs. 3*).—This study was undertaken to develop a method for improving the body of pasteurized cream so that it would compare favorably with the body of raw cream.

It was found that when pasteurized milk was cooled to 40° F. over a surface tubular cooler, warmed to from 80 to 85° over a surface tubular heater, and separated, the aged cream increased in viscosity to approximately double that of cream handled in the ordinary manner. In tests that could be applied to plant practice, cream at 40° was warmed to from 80 to 84° in an internal tubular heater in from 3 to 10 minutes and cooled to from 40 to 48° in an internal tubular cooler in the same length of time. A very desirable increase in viscosity was obtained by this method. The time and temperature of warming and cooling were the important factors concerned in this increase in viscosity. Subsequent warming of the cream reduced the viscosity of cream treated in the above manner. This method gave the greatest increase in viscosity with 30 and 40 per cent cream, but a noticeable increase was obtained with 20 per cent cream. The increased viscosity could not be attributed to an increased clumping of fat globules.

The inactivation of lipase in dairy products by traces of heavy metal salts, W. L. Davies (*Jour. Dairy Research [London], 3 (1932), No. 2, pp. 254–263, figs. 4*).—In this study at the University of Reading it was found that traces of heavy metals in amounts up to 25 parts per million inhibited the action of lipase in butter made from unpasteurized sweet cream in varying degrees, depending upon the concentration of the metal and upon the metal itself. Copper was the most potent of the metals studied, with iron, nickel, cobalt, manganese, and chromium less active, and tin and aluminum having no effect. The acidity produced was accompanied by fat-peroxide formation in amounts varying directly with acidity. This was attributed to the free oleic acid formed. The results suggest that destruction of lipase was catalyzed by the traces of heavy metals according to their varying powers of activating oxygen.

Cream refrigeration on the farm and the quality of butter manufactured, F. E. Price, C. J. Hurd, and G. H. Wilster (*Oregon Sta. Bul. 305 (1932), pp. 38, figs. 9*).—This study was undertaken to determine the effect of various methods of cooling and storing cream on the farm on the quality of butter that was made from it. An effort was also made to determine the best method of holding cream on the farm when it was to be shipped twice weekly.

Cream held in water at 60° F., the water being changed twice daily, remained sweet for 18 hours, but had an acidity from 0.4 to 0.5 per cent in 42 hours. In water at 50° cream was on the dividing line between sweet and sour with an acidity of 0.2 per cent at the end of 42 hours and had an acidity of 0.41 per cent in 66 hours. In an electric refrigerator having dry storage, cream remained sweet for twice-weekly shipments with both natural and forced air circulation. In water at 35 to 40° cream dropped from 80 to 56° in 1 hour and remained sweet for 90 hours. Cream was held in refrigerated water for 6, 12, 18, 42, 66, and 90 hours without developing objectionable flavors.

The cream used in this study came from farms located 5, 20 and 30 miles from Corvallis. It ranged in temperature from 44 to 50° when received during the cold months and from 51 to 57° during the hot months. The acidity and bacterial counts of these creams were uniformly low. The average score of butter made from the cream, both with and without starter, was 92.6 when fresh, 91.9 after 1 month's storage at 35 to 45°, and 92.1 after 6 months' storage at 0 to 10°. Both the fresh and stored butter scored higher when made with starter than when made without starter.

The average cost of the electric refrigerators was $500, the average power consumption was from 2 to 2.8 kw hours per day, and the average cost of refrigerating including interest and depreciation ran from 1.3 to 4.4 cts. per pound of butterfat. The 3-ct. premium paid per pound of fat for this cream was sufficient to pay for the cost of refrigeration when from 11 to 20 lbs. of butterfat were produced daily, but on a farm producing 6.5 lbs. of fat the premium did not cover this cost.

Some factors influencing the keeping quality of butter, S. B. Thomas and G. T. Morgan (*Welsh Jour. Agr., 7 (1931), pp. 290–298, figs. 3*).—On the basis of 400 samples of unsalted butter, milk, and cream graded and examined bacteriologically at University College, Aberystwyth, over a period of years, it was found that poor keeping qualities were experienced from December to February, probably due to the fact that at this period a large proportion of the milk came from cows that were drying off. From April to June there was a steady improvement in keeping quality coinciding with spring calvings and the turning of cows on pasture. The keeping quality dropped slightly during the hot months of July and August, followed by an improvement during the next three months, which was attributed to lower temperatures and better control of ripening. The best quality butter was produced during the spring and fall.

The manufacture of cheese from soft-curd and hard-curd milks, R. L. Hill and A. C. Merrill (*Utah Sta. Bul. 236 (1932), pp. 12*).—Continuing this study (E. S. R., 66, p. 170), it was found that hard-curded milk from the same breed of cattle (Holstein) yielded on the average 28 per cent more cheese than soft-curded milk. When greater extremes in curd hardness were used, a greater difference in yield could be expected. The yield of cheese per pound of fat in milk was also higher with hard-curded milk. The average Marshall rennet test was 5 for soft-curded milk and 3.5 for hard-curded milk. The average time required to cook soft-curded milk was 1 hour, while hard-curded milk was firm enough to cut in 35 minutes. It also required about 3° F. more heat to cook the soft-curded milk. The average acidity of the whey from hard-curded cheese was 0.19 per cent and from soft-curded cheese was 0.23 per cent. On the average it required 2 hours 30 minutes to mat hard-curded cheese and 1 hour 33 minutes to mat soft-curded cheese, but the latter was soft and mushy during the matting process. Soft-curded cheese lost approximately 30.3 per cent more fat in the whey than hard-curded cheese.

Soft-curded cheese ripened much faster than hard-curded cheese, but had a greater tendency to develop off flavors. Soft-curded cheese was brittle and soft and tended to break under the slightest strain. The flavor and keeping qualities of hard-curded cheese were much superior to those of the soft-curded cheese. The finish on hard-curded cheese was firm and free from curd cuts, while the opposite was true of soft-curded cheese.

Cheese-ripening studies, B. A. Eagles and W. Sadler (*Jour. Dairy Research [London], 3 (1932), No. 2, pp. 227–240, figs. 3*).—A biochemical and bacteriological examination was made of the course of ripening in Kingston cheese by the University of British Columbia, Canada. The study covered the period from the day of making to the ninety-eighth day of ripening.

During the process of ripening it was found that the amide nitrogen curve coincided with the subpeptone nitrogen curve, and the amino nitrogen curve superimposed itself upon the curve depicting the sum of subpeptone and peptone nitrogen. The results suggest that after the first few hours of ripening the proteolytic breakdown of Kingston cheese was of an associative peptic-tryptic-like nature.

Studies in Cheddar cheese.—I, The oxidation-reduction potentials of ripening Cheddar cheese, J. G. Davis (*Jour. Dairy Research [London], 3 (1932), No. 2, pp. 241–253, figs. 2*).—The results reported in this paper from the University of Reading are the first in a study of the fundamental biochemistry and bacteriology of Cheddar cheese ripening. A method is described for following the intensity of reduction at different levels in the interior of the ripening cheese. The variations in the potential throughout the course of ripening are described and mean values assessed.

It was found that the cheeses were not uniform throughout. Outer zones of a more highly oxidized condition were apparent near the surface of the cheese and around cracks and borings. The depth of these zones increased with the age of the cheese. The values obtained in these studies could be correlated with known bacterial data for Cheddar cheese. The significance of the findings in relation to cheese faults in discussed.

Cheese spreads, H. L. Templeton and H. H. Sommer (*Jour. Dairy Sci., 15 (1932), No. 2, pp. 155–162, fig. 1*).—In tests with cheese spreads at the Wisconsin Experiment Station, it was found that desirable spreading qualities may be due to the moisture or fat content of the product or a combination of the two. High moisture with relatively low fat content gave a mealy texture,

but as the fat increased the consistency became like that of butter. High moisture and fat content resulted in a weak-bodied, poor-appearing spread. It was necessary to use a high heat treatment in the manufacture of cheese spreads because of the high moisture content, less acid reaction, and presence of putrefactive organisms when cream was used. A reaction of pH 5.8 to 6.1 was found to be satisfactory for these spreads.

A system for calculating the amounts of the different ingredients to be used in making spreads is described and illustrated.

An auxiliary evaporating and preheating apparatus for drying whey, milk and other liquids by the roller process, J. Golding and E. Rowsell (*Jour. Dairy Research [London], 3 (1932), No. 2, pp. 264–271, figs. 4*).—The development of an apparatus for drying whey is described in this paper from the University of Reading.

VETERINARY MEDICINE

A textbook of bacteriology, K. L. Burdon (*New York: Macmillan Co., 1932, pp. XIII+542, pl. 1, figs. 89*).—Part 1 of this work deals with the fundamentals of bacteriology (pp. 1–159), part 2 with laboratory study of bacteria (pp. 161–213), part 3 with infection and resistance (pp. 215–334), and part 4 with bacteriology of important infectious diseases (pp. 335–507). Supplementary information is contained in an appendix (pp. 509–529).

The "killing" of bacteria by bacteriophage, C. H. Andrewes and W. J. Elford (*Brit. Jour. Expt. Path., 13 (1932), No. 1, pp. 13–21, figs. 5*).—The authors find that "a specific phage added in excess to B[*acillus*] *coli* can within a few minutes, and perhaps within a few seconds, so affect the organisms that they are rendered incapable of propagation; in orther words, it apparently 'kills' them immediately. At 37° C. lysis of these killed organisms follows in 20 to 30 minutes. At 20°, although the killing has taken place at once, lysis may not be demonstrable or may occur only after some hours. Sodium citrate seems to act on this coli-phage by preventing its multiplication. It can not prevent killing of coli if phage is added in excess, but such killed phage will not lyse if citrate is present. The experiments described with a strain of *B. coli* and a homologous phage will not necessarily be reproducible with any other race of bacteriophage."

Value of desiccation and identification of blood typing serums, C. S. Bryan (*Soc. Expt. Biol. and Med. Proc., 29 (1932), No. 7, pp. 875–877; abs. in Michigan Sta. Quart. Bul., 15 (1932), No. 1, pp. 47, 48*).—The condition of preserved typing serums being of importance in the accuracy of a blood group determination, desiccation was applied as an additional means of preservation, since there is a confusing precipitate formed at the time liquid phenolized serums are used. The value of identification of stained typing serums, as advocated by L. Rosenthal[4] and Rosenthal and O. S. Hornick[5] in 1931, was recognized and desiccation was also applied thereto, large drops of serum being dried on ordinary microscopic slides. The procedure followed in using these desiccated serums is described. Such preserved serums were found to keep as long as 11 months without deterioration.

[Work in animal pathology] (*Utah Sta. Bul. 235 (1932), pp. 45, 46–48*).—The report of the work of the year includes brief reference to an outbreak of keratitis; the application of blood serum agglutination tests on dairy cattle affected with infectious abortion, a circular relating to the control and eradi-

[4] Jour. Lab. and Clin. Med., 16 (1931), No. 11, pp. 1123, 1124.
[5] Soc. Expt. Biol. and Med. Proc., 28 (1931), No. 5, pp. 516, 517.

cation of which has been noted (E. S. R., 65, p. 670); the study on the transmissibility of infectious abortion among dairy cattle in a Utah dairy village; the application of the follicle method in vaccinating for fowl pox; and the susceptibility of cattle to inoculations with acid-fast organisms isolated from so-called tubercular skin lesions, work with which by Daines and Austin has been noted (E. S. R., 67, p. 455).

[Studies in comparative pathology in Japan] (*Jour. Japan. Soc. Vet. Sci., 11 (1932), No. 1, pp. 1–80, pls. 6*).—The contributions here presented (E. S. R., 67, p. 451) are as follows: Investigations of Infectious Papular Stomatitis of Cattle in Manchuria, by M. Yosikawa (pp. 1–19, Ger. abs. pp. 17–19); Histopathological and Statistical Studies on the Sarcomata of the Fowl, by D. Nimii (pp. 20–36, Japan. abs. pp. 35, 36); Concerning the Influence of Cold on the Antigenic Action of Antirinderpest Vaccine, by C. Kakizaki, C. Isshiki, and N. Tomonaga (pp. 37–43, Ger. abs. pp. 42, 43); Studies on "Hypodermatotoxin," Toxin Obtained from the Larvae of *Hypoderma* sp. at the Esophageal Stage—II, Biological Significance of Hypodermatotoxin from the Point of View of Its Hemorrhagic and Dermolytic Actions, by S. Ono (pp. 44–55, Eng. abs. pp. 53, 54); Studies on the Purification of Mallein—I, by M. Umezu (pp. 56–72, Eng. abs. pp. 71, 72); and Comparative Studies of *B[acterium] abortivo-equinus* and *B[acillus] paratyphosus* B—I, Bacteriostasis, by K. Kasai, K. Ogura, and C. Kohanawa (pp. 73–80, Eng. abs. pp. 79, 80).

The serological differentiation of smooth strains of the Brucella group, G. S. Wilson and A. A. Miles (*Brit. Jour. Expt. Path., 13 (1932), No. 1, pp. 1–13, fig. 1*).—The work here reported, together with that contained in a paper by Pandit and Wilson (E. S. R., 66, p. 772), has led the authors to conclude that the Brucella group contains members which may be primarily classified as smooth and rough strains. The smooth strains, comprising *B. abortus* of bovine and porcine origin and *B. melitensis*, are nonthermoagglutinable, and though sometimes agglutinated slightly by acid are not agglutinated by salt. The rough strains, comprising *B. para-abortus* and *B. paramelitensis* are thermoagglutinable, are agglutinated strongly by acid, and not infrequently by salt.

In their typical forms smooth and rough strains have no serological relationship, though intermediate strains occur containing both smooth and rough antigen. Using sera prepared against absolutely smooth strains, it is possible by the agglutinin absorption technic to divide the smooth members into two types, one type containing bovine and porcine *B. abortus*, the other type containing *B. melitensis* strains. Evidence is brought to suggest that the distinction between *B. abortus* and *B. melitensis* strains is due not to the presence of qualitatively different antigens but to the different quantitative distribution of two common antigens. Provided due regard is paid to the relationship between the absorbing dose and the titer of the serum, monospecific sera can be prepared in which the major agglutinin of the type alone persists. By means of these sera unknown strains of the Brucella group can be readily typed by direct agglutination.

The results of testing 100 strains by monospecific sera are recorded and, with a single exception afforded by a group of strains from a particular locality, are seen to be in close accord with conclusions reached on epidemiological and other grounds. The rough strains have not been fully studied, but it appears that there is at least one antigen common to all *B. para-abortus* and *B. paramelitensis* strains. It is suggested that the reason why so many previous workers have failed to differentiate serologically between *B. abortus* and *B. melitensis* is because they have not realized the importance of using absolutely

smooth strains for the preparation of their sera. Since *B. melitensis* strains have a marked tendency to become rough in the laboratory, it is, as a rule, difficult to obtain satisfactory sera against the *B. melitensis* type unless recently isolated strains are used. Unless perfectly smooth strains are employed, the resulting sera will contain some rough agglutinin, which will tend to obscure the clear differentiation of the types.

It is pointed out that so far as the smooth forms are concerned the work of the authors confirms the conclusions previously reached by Ross (E. S. R., 58, p. 875) as the result of examining a small number of strains.

Metabolism studies on the Brucella group, III–IX (*Jour. Infect. Diseases, 50 (1932), No. 5–6, pp. 538–541; 51 (1932), Nos. 1, pp. 72–116, figs. 3; 2, pp. 344–381, figs. 6*).—The following contributions (E. S. R., 65, p. 569) are presented: III, Viability in Aqueous Solutions, by C. E. and M. H. ZoBell (pp. 538–541); IV, The Bacteriostatic Action of Dyes, by K. F. Meyer and C. E. ZoBell (pp. 72–90); and V, The Production of Hydrogen Sulphide (pp. 91–98), VI, Nitrate and Nitrite Reduction (pp. 99–108), VII, Dextrose Utilization (pp. 109–116), VIII, Nutrient Requirements in Synthetic Mediums (pp. 344–360), and IX, Physicochemical Requirements in Synthetic Mediums (pp. 361–381), by C. E. ZoBell and K. F. Meyer.

Production of agglutinins for Brucella abortus in calves, swine, and rabbits by skin and mucous membrane contact, L. E. Starr (*Jour. Amer. Vet. Med. Assoc., 81 (1932), No. 2, pp. 230–238*).—Work at the Virginia Experiment Station, the details of which are given in tabular form, "indicates that agglutinin production may result in calves, rabbits, and swine following contact with *B. abortus* on the skin or conjunctival mucous membrane, abraded or unabraded. Young calves are comparatively resistant to *B. abortus* infection. Skin and mucous membrane contact may be responsible for many of the low titer positive reactions found in cattle and swine."

Inheritance of resistance and susceptibility to infectious abortion, M. Manresa (*Jour. Infect. Diseases, 51 (1932), No. 1, pp. 30–71, figs. 16*).—The author's studies, contributed from the Wisconsin Experiment Station and the University of the Philippines have led to the following conclusions:

"A predisposition for susceptibility and resistance to infectious abortion is a definite characteristic of each strain or family of rabbits. These characteristics are transmitted by inheritance to successive generations, probably through a single pair of Mendelian factors. The characteristic for resistance is dominant over that for susceptibility. Whether this dominance is complete or partial is a matter for future study. An appreciable amount of immunity is developed in susceptible does following artificial inoculations with a virulent strain of *B[acterium] abortus*. The immunity so conferred is transitory."

Further observations on the control of contagious abortion by means of blood-testing and segregation, I. E. Newsom and F. Cross (*Jour. Amer. Vet. Med. Assoc., 81 (1932), No. 2, pp. 195–208*).—In further investigations (E. S. R., 57, p. 279) conducted at the Colorado Experiment Station, the details of which are here presented in tabular form, the authors have found that "in the control of abortion disease by means of the blood test and segregation the dangerous animal is the infected cow that aborts in the clean herd before becoming a positive reactor. During the eradication process it is unsafe to return an aborter to the clean herd in less than 1 year after her isolation. After the herd is clean, these negative aborters may be disregarded except for a 30-day isolation period.

"While a few positive animals, especially the low reactors, will become negative and can be safely returned to the herd, the percentage is small and

the procedure is of questionable value. Except in special cases the double herd system is a failure, and in most instances the immediate elimination of all reactors and aborters will be found most economical."

Bang's-disease control, M. JACOB (*Tennessee Sta. Rpt. 1931, p. 26*).—A brief reference is here made to the work of control and eradication of infectious abortion in the State.

Foot-and-mouth disease lesions in the ear epidermis of inoculated guinea-pigs, T. HARE (*Jour. Path. and Bact., 35 (1932), No. 2, pp. 291–293, pls. 2*).—In work at the Royal Veterinary College, London, the author found that the persistence of foot-and-mouth disease virus in the ear epidermis of guinea pigs to at least the tenth day after infection is associated with the presence of specific microscopic lesions to the eleventh day after infection. The formation of the initial lesion continues from the second to the fifth day after infection as a characteristic degeneration of a single cell of the stratum germinativum. The formation of vacuoles and vesicles continues from the third to the seventh and from the fifth to the eighth days after infection, respectively. The vesicular exudate is discharged from the fifth to the eleventh day after infection. The stages in the development of a single lesion appear to occupy from three to six days.

Filtration of the virus of foot-and-mouth disease through a new series of graded collodion membranes, I. A. GALLOWAY and W. J. ELFORD (*Brit. Jour. Expt. Path., 12 (1931), No. 6, pp. 407–425, figs. 2*).—In work at the National Institute for Medical Research, Hampstead, London, the authors found the virus of foot-and-mouth disease in broth medium to pass through all graded collodion membranes of an average pore diameter greater than 25$\mu\mu$, and to be effectively retained below this limit of permeability. The size of the virus was estimated to be 8–12$\mu\mu$, and was shown to be intermediate between that of bacteriophage (coli) and oxyhemoglobin. No evidence was obtained that the virus of the Vallée and Carré "O" type differs in size from the Vallée and Carré "A" or Waldmann and Trautwein "C" types as claimed by I. Modrow.[6] The viruses of all three strains were found to filter with equal facility when the conditions of medium, variation in membrane thickness and concentration of virus, and applied filtration pressure upon the course of filtration were taken into consideration. These conditions are discussed. The variation of pH over the range 6.40–8.75, within which the virus is stable, has had no appreciable effect on the filtration of the virus of foot-and-mouth disease.

Locoism in domestic animals, F. P. MATHEWS (*Texas Sta. Bul. 456 (1932), pp. 28, figs. 12*).—This is a report of an experimental study of loco plant poisoning which occurs in the region of the loco weed research laboratory, established at Alpine in April, 1930, with a view to discovering some effective methods for combating losses from this source.

The work, conducted cooperatively by the station and the U. S. D. A. Bureau of Animal Industry, has shown that the species *Astragalus earlei* and *A. wootoni*, occurring in the Davis Mountain region, are about equally toxic to livestock. Cattle, sheep, and goats show a greater reluctance to eat *A. wootoni* than *A. earlei*.

The susceptibility among animals of the same species was found to be quite variable. "The susceptibility of cattle, sheep, and goats is about the same. Horses are much more susceptible than cattle, though they are more averse to eating the plants. Less loco plant was required to produce a critical stage of locoism when concentrates were added to the ration than was required when

[6] Ztschr. Hyg. u. Infektionskrank., 110 (1929), No. 4, pp. 618–643.

the ration consisted of loco plant and hay. The milk of animals suffering from locoism did not produce symptoms of locoism in their calves.

"The symptoms produced by feeding *A. wootoni* are practically identical with those caused by feeding *A. earlei*, and resemble the established symptoms of locoism produced by eating other species of loco plants. The clinical manifestations of the disease in goats were quite different from those in other animals. In cattle, abortions are caused by feeding *A. earlei*, but fertility is not impaired in either cattle or goats. In pregnant cows an edema of the fetal membranes and an increase in the amount of amniotic fluid may be associated with eating *A. earlei*. This condition is erroneously called 'water belly' by the ranchmen. Conjunctivitis, keratitis, and excessive lacrimation are associated with locoism. The maximum toxic effects may not appear until several weeks after an animal is deprived of *A. earlei*. The gross and microscopic pathology produced by feeding *A. earlei* is practically the same as that produced by feeding *A. wootoni*. Ulcerations of the pylorus were frequent, although not diagnostic lesions of the disease. A definite gross pathology was not observed in the central nervous system. Edema of the nerve cells in the central nervous system was observed. This change was of a transitory nature and disappeared long before the symptoms of the disease. The dust from *A. earlei* and *A. wootoni* is very irritating to the eyes and the upper respiratory tract of man. The complete toxic syndrome for man is unknown. Therefore prolonged exposures to the dust from this source should be avoided."

The curative action of anti-pneumococcus serum (type I) in mice, G. F. Petrie and W. T. J. Morgan (*Brit. Jour. Expt. Path., 13 (1932), No. 1, pp. 96–108*).—It was found that "a single dose of a natural antipneumococcus serum (type I), when given intarvenously to mice up to 12 hours after an infecting dose of a highly virulent culture, is able to cure the infection even when a bacteremia is present. The infecting dose employed in these experiments contains about 50 diplococci and is fatal to 93 per cent of control mice. The interval of 12 hours between the infecting dose and the dose of serum represents one-quarter of the mean death time of control mice which receive this dose of culture. A concentrated preparation of the specific antibody (type I) is also able to exert a curative action under similar conditions."

Investigations on the virulence of vesicular stomatitis virus and the properties of immune sera, K. Wagener (*Jour. Amer. Vet. Med. Assoc., 81 (1932), No. 2, pp. 160–172*).—In experiments conducted in Germany, here reported in detail in tabular form, it was found that "the guinea pig convalescent serum in vesicular stomatitis has viricidal properties which can be demonstrated in vivo and in vitro. The passive immunity test, as well as the test in vitro, can be used for a standardization of the vesicular stomatitis virus and immune serum. The virus of vesicular stomatitis develops its highest virulence about 24 hours after the cutaneous inoculation of the guinea pig, but before vesicle development has passed its peak. The size of the vesicle is not a measure of virulence. It does not seem that the virus, when continuously transferred at its highest virulence from one guinea pig to another at intervals of 24 hours, can be kept at its original higher virulence. The natural decrease of virulence in such a virus seems to develop more quickly than in the virus which is transferred at intervals of 48 hours."

New studies on the filtrability of pure cultures of the tubercle group of micro-organisms, R. R. Mellon and L. W. Fisher (*Jour. Infect. Diseases, 51 (1932), No. 1, pp. 117–128*).—The authors report that "a bacillus, somewhat variable in its acid fastness, was studied six years ago under conditions where it developed nonacid-fast granules (Much), which were filtered through a Berkefeld N filter. These underwent slow and capricious germination to a

nonacid-fast diphtheroid organism with cultural characteristics quite in contrast with the original. During the interim a seasonal dissociation, spontaneous in character, recurred in the spring of the year in four of six years that the strain had been under observation. Such periodicity was described by De Vries with the higher plants. More recently, these observations were repeated and extended; for in addition to the diphtheroid form, the original cultural form of the organism was recovered from the filtrates. This appeared to have been induced by a more complete 'maturation' of the same gonidial granules that yielded only the diphtheroid if imperfectly matured.

"Similar results have been observed with bovine and avian strains of tubercle bacilli as far as the isolation of the nonacid-fast forms from the filtrates is concerned. These forms seem to take origin from the granules of Much, thus correlating these classic forms with the nonacid-fast variants that have been described as originating from tubercle cultures.

"We isolated almost identical strains with acid-fast granules from such diseases as Hodgkin's disease, benign lymphogranulomatosis (Schaumann), and Boeck's sarcoid, making it seem probable that their in vivo origin may also be from the tubercle bacillus. No opinion can at present be vouchsafed in respect to their rôle in the pathogenesis of such diseases."

Observations on the longevity of Mycobacterium tuberculosis of bovine origin, W. H. Feldman (*Jour. Amer. Vet. Med. Assoc., 81 (1932), No. 2, pp. 223–229*).—It is pointed out that "the viability of different strains of *M. tuberculosis* in naturally infected lesions of bovine tuberculosis is extremely variable. Twenty-two emulsions prepared by grinding lesions from as many different cattle in a solution of physiologic sodium chloride and kept at a temperature of 5 to 10° C. were found in most instances to possess viable organisms that were virulent for guinea pigs for approximately one year. After one year it was unusual for a strain to retain its viability, although a few strains were encountered that were capable of remaining virulent at ice box temperatures for as long as 450 days. The limitation or the duration of virulence was not determined.

"The structural integrity of the uncultured bacillus of tuberculosis of bovine origin is extremely stable under the conditions which obtained in this experiment, since there was no appreciable morphologic alteration detected in the acid-fast bacteria present in any of the emulsions. Although there is some evidence that certain strains of *M. tuberculosis* suffer progressive diminution of virulence after prolonged residence at ice box temperatures, the exact status of this has not been determined."

Further attempts to transfer the immunological response of tuberculous animals, L. Dienes (*Jour. Immunol., 23 (1932), No. 1, pp. 29–34*).—A report is given of three groups of experimental attempts to transfer to other animals the increased immunologic response of tuberculous animals.

"The transfer of tuberculous omenta or tuberculous peritoneal exudate, a few minutes after the injection of egg white, to the peritoneal cavity of normal pigs was unsuccessful. Where a similar transfer was made into the peritoneal cavity of a previously infected animal, in a stage of infection in which the injection of egg white alone does not produce the characteristic effect, irregular positive results were obtained. A simultaneous injection of egg white and tubercle bacilli was in these guinea pigs often successful. The experiments suggest that two factors are involved, (1) the effect which the lesion itself produces upon the antigen, and (2) a certain preparation of the organism as a whole occurring during the course of the infection."

Cross-immunity between South African typhus and tick-bite fever, A. Pijper and H. Dau (*Brit. Jour. Expt. Path., 13 (1932), No. 1, pp. 33–35, fig. 1*).—

The authors find that the virus of South African typhus confers immunity against tick bite fever virus in guinea pigs. Tick bite fever virus, however, does not confer immunity in guinea pigs against South African typhus.

An interesting case of nymphomania in a virgin heifer, C. F. Clark (*Jour. Amer. Vet. Med. Assoc., 81 (1932), No. 2, pp. 258, 259*).—This is a case report contributed from the Michigan Experiment Station.

The histopathology of cutaneous and subcutaneous nodules of cattle, R. A. Runnells (*Jour. Amer. Vet. Med. Assoc., 81 (1932), No. 2, pp. 173–186, figs. 6*).—The author found that "the gross appearance of subcutaneous nodules can not be entirely relied upon in making a differential diagnosis of pyogenic abscesses, foreign body pseudotubercles, and nodules now diagnosed as tuberculosis and lymphangitis. In some cases a differentiation between the microscopic appearance of an old tuberculous abscess and an old pyogenic abscess of the subcutis is difficult. It is quite possible that the former infection is supplanted by the latter, and as a consequence the structure of the tubercle is lost. The tubercle of the disease designated as lymphangitis in California can not be differentiated histologically from the tubercle called tuberculosis in some other parts of the country and Canada."

A disease affecting the legs of cattle, L. P. Doyle (*Jour. Amer. Vet. Med. Assoc., 81 (1932), No. 2, pp. 256–258, figs. 2*).—This contribution from the Indiana Experiment Station reports briefly upon a disease observed to be affecting the front legs of cattle during the late summer and fall of 1931. It occurred as far north as Miami County, with as many as 500 cases reported in one of the southern counties. Its cause was not definitely determined.

Bacillus abortus in hygroma of dairy cow, H. R. Seddon and W. L. Hindmarsh (*Aust. Vet. Jour., 8 (1932), No. 3, pp. 100, 101*).—The authors record the finding of *B. abortus* in a hygroma of the dairy cow in New South Wales.

Cattle as a possible source of infection from Brucella abortus var. suis, A. H. Harms (*Jour. Amer. Vet. Med. Assoc., 81 (1932), No. 2, pp. 246–249*).—In work at the Kentucky Experiment Station, "an organism isolated from the aborted fetus of a heifer was identical with bovine strains in that it required several successive cultures before it adapted itself to aerobic growth. In all other tests it was identical with *B. abortus* var. *suis*."

Agglutination test in the diagnosis of infectious abortion in cattle (Bang's disease), C. R. Donham and C. P. Fitch (*Jour. Infect. Diseases, 51 (1932), No. 1, pp. 162–190*).—In studies at the Minnesota Experiment Station, "there were discrepancies in the results obtained by a single technician testing duplicate samples of bovine serums with the same rapid antigens and in the results obtained by different technicians using the same serums and rapid antigens. Commercial rapid antigens were found to be not equal in sensitivity. Most discrepancies in the results of the rapid agglutination test and in the results of this method as compared with those of the test tube method were in serums of from low to medium agglutinin content. The discrepancies in the results of the rapid agglutination test concerned only from 5 to 6 per cent of the bovine serums received in routine.

"It was not possible to adjust satisfactorily the sensitivity of the rapid-test antigen by varying the bacterial concentration. Factors other than bacterial concentration are involved. The change in the bacterial concentration of the rapid-test antigen by the addition of various amounts of agglutinating serum to the antigen and maintaining uniform total volumes of the serum-antigen mixtures were not of value in the technic of the rapid agglutination test. There was no significant difference in the sensitivity of rapid-test *Br[ucella] abortus* antigens containing concentrations of sodium chloride varying from 0.85 to 15 per cent.

"The extent of visible agglutination after from 2 to 14 minutes in the rapid test was dependent, in part, on the dilution of the agglutinating serum and antigen with saline solution in the antigen, an increase in the amount of saline solution resulting in a lower agglutination titer. Also the less the bacterial concentration . . . , within certain limits, the higher was the agglutination titer. The rapid-test antigen is composed of two materials, bacteria and saline solution, which exert an influence on the agglutination titer, one working in opposition to the other."

Studies in calfhood immunization against Bang's disease, A. L. DELEZ (*Jour. Amer. Vet. Med. Assoc., 81 (1932), No. 2, pp. 239–245*).—The results obtained at the Indiana Experiment Station in bred heifers which had received intravenous injections of *Brucella abortus* during the first month of age are summarized as follows:

"Two heifers which gave only slight response to the calfhood injection, as indicated by the blood agglutination titers, aborted when given an intravenous exposure of a virulent strain of *B. abortus*. The infection was revealed in each case at the time of abortion and also in the udders at autopsy. One heifer which received no further exposure following the calfhood injection aborted. Uterine and udder infection with *B. abortus* was demonstrated. Two heifers which also received only the calfhood injections carried their calves to a full term. At parturition there were gross lesions suggestive of *B. abortus* infection in both cases. Bacteriological examination failed to show the presence of the organism in either case. An uninjected control heifer was allowed to associate with the injected animals and calved normally. Later she was found susceptible. A diffuse interstitial mastitis was observed in the heifers from which *B. abortus* was isolated."

Mal de caderas of bovines in Paraguay [trans. title], L. E. MIGONE and R. PEÑA (*Bul. Soc. Path. Exot., 25 (1932), No. 6, pp. 590–597*).—Although sporadic cases of this disease of bovines have occurred in certain regions of Paraguay for some 20 years, it has spread rapidly in the last 5 years and become the most important of all the epizootic diseases of cattle. The average morbidity was found to be from 10 to 20 per cent, reaching from 50 to 60 per cent on the prairie in the Department of Mbuyapey. The mortality always reaches above 95 per cent. The authors have demonstrated that in Paraguay this disease of cattle is caused by a virus very similar to that of rabies but differing in virulence.

Mal de caderas of the bovine [trans. title], R. URÍZAR (*An. Inst. Nac. Parasitol. [Asunción], 5 (1932), No. 5, pp. 83–99, pl. 1*).—An account of the present knowledge of this disease, which appeared in Paraguay in four departments in 1927 and now occurs throughout the eastern part of the Republic. A map showing the occurrence of the disease in Paraguay is included.

Mastitis in the dairy herd, C. S. BEYAN (*Michigan Sta. Quart. Bul., 15 (1932), No. 1, pp. 22–24*).—A brief practical account is given of this affection in the dairy cow and measures for its control.

The control of pleuro-pneumonia contagiosa of bovines, H. E. ALBISTON, T. S. GREGORY, and R. N. JOHNSTONE (*Aust. Vet. Jour., 8 (1932), No. 2, pp. 58–63*).—A brief account is given of control work with contagious pleuropneumonia, which was introduced into Australia more than 70 years ago and is now present in every Australian State with the exception of Tasmania. A committee of the Veterinary Association of Victoria which has investigated the value of inoculation reports as follows:

"Taking into consideration (1) the fact that the inoculation of cattle after pleuropneumonia has appeared in the herd can not be relied on to check the spread of the disease, (2) the interference of inoculation with the serological

diagnosis, and (3) the special conditions existing in Victoria with regard to inspection, isolation, quarantine, and slaughter, the committee recommends that as a departmental procedure inoculations of infected herds should be definitely prohibited. With regard to in-contact herds the question is more open, but here again there is little to encourage inoculation. If infection has not already been transmitted, then effective quarantine measures should prevent its introduction."

Some helminth parasites reported from Australia for the first time, with a description of Cooperia mcmasteri sp. nov. from a calf, H. McL. Gordon (*Aust. Vet. Jour., 8 (1932), No. 1, pp. 2–12, figs. 6*).—Included in this account is a description of *C. mcmasteri* n. sp., collected from the small intestine of a calf and associated in equal numbers with *C. oncophora* (Rail.).

Caseous lymphadenitis: Ingestion as a method of infection of sheep with the Preisz-Nocard bacillus, H. R. Carne (*Jour. Council Sci. and Indus. Research* [*Aust.*], *5 (1932), No. 2, pp. 98–102*).—The results of experiments conducted indicate that Preisz-Nocard bacilli which reach the lumen of the intestine either by traversing the abomasum or by introduction through the rectum do not find suitable conditions there for penetrating into the tissues of the host to produce their characteristic lesions.

Caseous lymphadenitis: The growth of the Preisz-Nocard bacillus in sheep faeces, H. R. Carne (*Jour. Council Sci. and Indus. Research* [*Aust.*], *5 (1932), No. 2, pp. 103–109*).—The author's experiments indicate that the overgrowth of the Preisz-Nocard bacillus in nonsterilized feces is a definite possibility, and that the organism is able to maintain itself in the presence of at least one of the common bacteria of sheep feces. The author has experimental proof that this organism is able to survive in sterilized sheep feces which have been protected from direct sunlight for over a year.

Soremouth (contagious ecthyma) in sheep and goats, H. Schmidt and W. T. Hardy (*Texas Sta. Bul. 457 (1932), pp. 22, fig. 1*).—The disease known as sore mouth, or contagious ecthyma, in sheep and goats, is an infectious disease, which occurs especially in young animals. It is quite prevalent on the range in the sheep and goat raising area in western Texas and elsewhere. Sometimes it is also very troublesome among feeder lambs in the feed lot, and older animals may also be infected artificially.

The disease is characterized by a swelling of the lips, followed by papules, vesicles, pustules, and scab formation, so that the lips in the end become stiff, unpliable, and covered with crusts. The crusts are finally shed and the lesions heal without leaving a scar. The disease itself is not very fatal, but losses from screw worm infestation of the lesions, from reduced thriftiness of the young animals, or from shrinkage in the feed lots may be very heavy. The authors have found that filtration of the causative agent, which has been reported to be a filtrable virus, is difficult to obtain. The lesions remain localized irrespective of the site of inoculation. The authors' results, as well as those of others, indicate that one attack of the disease leaves a well-marked immunity, and that such an immunity develops irrespective of the localization of the lesions on the skin. It is proposed to utilize this fact and inoculate the young animals on some part of the body other than the lips before screw worm time arrives.

A list of 15 references to the literature is included.

Some data concerning the infectivity, survival, and powers of diffusion of the virus of "louping-ill," J. Czarkowska-Gladney and E. W. Hurst (*Brit. Jour. Expt. Path., 12 (1931), No. 6, pp. 426–430*).—The authors have found that, "on progressive dilution of a 1 per cent filtrate, infection may still be obtained by the intracerebral inoculation of a strength of 1:1,000,000 and

sometimes with 1:10,000,000. In the storage of infective filtrates, the presence or absence of oxygen makes little difference to survival of the virus; the periods of survival of the virus at different temperatures have been ascertained. Figures for the survival of virus in pieces of brain tissue kept in Petri dishes at various temperatures or in glycerin in the cold room have been determined. Clear evidence of the ability of the virus to diffuse into liquid media has been obtained."

Preliminary studies in the tick transmission of louping-ill, I, II, J. MACLEOD (*Vet. Jour., 88 (1932), No. 7, pp. 276–284, fig. 1*).—Following a review and analysis of previous transmission experiments (pp. 276–279), the author reports upon a study of the reaction of sheep to tick infestation (pp. 279–283). He found that a temperature reaction occurred in sheep as a result of their infestation by the sheep tick, officially known as the castor-bean tick, which is due not to the infestation but to an infective agent which the tick introduced. The reaction could be transmitted from sheep to sheep in sequence by inoculation of blood. Blood was infective for sheep when drawn 44 days after the febrile reaction had subsided. This tick-borne febrile condition represents a definite pathological entity, the causal agent of which is distinct from the virus of louping-ill.

Observations on the resistance of sheep to infestation by the stomach worm (Haemonchus contortus), I. C. Ross (*Jour. Council Sci. and Indus. Research [Aust.], 5 (1932), No. 2, pp. 73–80*).—Field observations and experiments reported are discussed under the headings of natural resistance, age resistance, acquired immunity, and nutritional factors and resistance. It is concluded that there is ground for believing that individual natural resistance may play an important part in determining the degree of infestation set up naturally or artificially in lambs. There is little experimental evidence that aged sheep, with the possible exception of lambing ewes, are less susceptible to infestation than young lambs, though they certainly show less marked effects of such infestation. It appears that while an acquired immunity to *H. contortus* not infrequently follows a heavy degree of infestation, such resistance, even in aged animals, may be of such temporary duration that the animals may subsequently be reinfested.

Bacilius abortus found in lesions of fistulous withers in a horse, H. R. SEDDON (*Aust. Vet. Jour., 8 (1932), No. 3, p. 100*).—The author records the finding of *B. abortus* in a fistulous withers lesion of a draft horse in New South Wales.

Contribution to the symptomatology and therapy of Piroplasma caballi, A. BERGTHAL (*Vet. Jour., 88 (1932), No. 7, pp. 303–306*).—The author finds that the intravenous injection of trypaflavine constitutes a very useful form of treatment in piroplasmosis of the horse due to *P. caballi.*

The common parasites of horses, F. THORP, JR., and R. GRAHAM (*Illinois Sta. Circ. 357 (1932), pp. 29, figs. 27*).—A practical account of the common parasites of horses and the means for combating them.

Tick paralysis in the dog caused by nymphs of Ixodes holocyclus, I. C. Ross (*Aust. Vet. Jour., 8 (1932), No. 3, pp. 102–104*).—The author records the finding of a case of tick paralysis in the dog caused by a single adult female of *I. holocyclus.*

On the control of caecal coccidiosis in chickens, W. L. CHANDLER (*Michigan Sta. Tech. Bul. 127 (1932), pp. 24, figs. 5*).—In dealing with dietary methods of control of cecal coccidiosis, which is due to *Eimeria tenella* Raill. and Luc. the author finds that while the experimental data relative to such are not extensive, they indicate that a feed containing 15 per cent powdered milk is an aid. "They also indicate that beneficial results are obtained by supplying

iodine in amounts slightly in excess of the birds' normal requirements. Since the daily feeding of a ration containing powdered milk in excess of 15 per cent apparently has no advantage over a 15 per cent powdered milk ration, it is possible that the value of the powdered milk may be due to the nutrient value of this concentrated form of protein and that birds can not assimilate powdered milk in excess of 15 per cent of the feed ration." It is pointed out that the value of the so-called milk flush, a feed containing 40 per cent powdered milk for one or two days, "may be due to its stimulating a rapid multiplication of certain bacterial organisms in the intestines of the bird and in the watery droppings which are voided following this feed. Some of the products resulting from rapid bacterial growth are toxic to at least some stages of coccidia."

The value of sanitation and disinfection is emphasized.

In respect to its action on coccidial oocysts, the author found colloidal iodine to be the only material which will destroy them within a time period that would favor its practical application as a disinfectant. "To exert a lethal action on coccidial oocysts, colloidal iodine must be in contact with them while the iodine is in a free state for a period of from one to two minutes. Since iodine is readily destroyed by organic matter, it will be apparent that prior to the application of colloidal iodine as a disinfectant to floors these should be thoroughly cleaned. As compared with the strength and volume of colloidal iodine which will kill coccidial oocysts in vitro, the volume and strength recommended for surface disinfection (3 gal. of suspension containing from 0.2 to 0.4 per cent iodine content per 100 sq. ft. of surface) are amply sufficient to accomplish practical disinfection after brooder house floors of wood, concrete, or asphaltum have been cleaned by the poultryman."

It was concluded that the possibility of immunizing a flock of chicks against severe infection by feeding young chicks a few oocysts or by permitting them to haphazardly acquire infections is very remote. It is pointed out that in attempting to prevent initial infections with *E. tenella*, all possible sources of such infection should be given consideration, including infections in old birds on the poultry plant or nearby plants, oocysts present on the floor or brooder house equipment as the result of previous infections, incubator infections, and infections in neighboring flocks, the oocysts from which may be carried by flies or by sparrows and other birds and on the clothing of the poultryman and visitors.

Anemia and erythroleucosis occurring spontaneously in the common fowl, E. L. Stubbs and J. Furth (*Jour. Amer. Vet. Med. Assoc., 81 (1932), No. 2, pp. 209–222, figs. 2*).—The authors here report upon three instances of severe chronic spontaneous anemia, one spontaneous erythroleucosis, and one that appeared intermediate, observed in a flock of fowls in Pennsylvania.

Vitamin B and fowl paralysis, W. P. Blount (*Vet. Jour., 88 (1932), No. 7, pp. 289–299*).—This is a review of the literature relating to the etiology of fowl paralysis, presented in connection with a list of 28 references. Since fowl paralysis is a neoplastic process associated with lymphocyte-like cell infiltration, the author feels that it is not unreasonable to conclude that a diet rich in vitamin B will favor the progress of such tumors, especially as poultry keepers are known to be feeding an excess of this vitamin.

AGRICULTURAL ENGINEERING

Forests and stream flow, W. G. Hoyt and H. C. Troxell (*Amer. Soc. Civ. Engin. Proc., 58 (1932), No. 6, pp. 1037–1066, figs. 9*).—This paper brings together and analyzes the results of investigations from various sources on the effect on stream flow of changes in forest and brush cover on specific natural areas.

An experiment by the U. S. D. A. Forest Service and Weather Bureau was conducted from 1910 to 1926 on two contiguous tracts of land in southern Colorado. Stream-flow measurements by the U. S. Geological Survey in cooperation with the State of California and the county of Los Angeles were begun in 1916 on certain areas in California, on some of which accidental denudation by burning afforded opportunity for comparisons. Detailed observations were made in both these areas for several years before changes in cover were accomplished by cutting and by fire, and were continued for several years after such changes.

With reference to total run-off. it was found that forests did not conserve the water supply, because after their removal there was an increase in average annual yield amounting to 15 per cent in a mountain area in Colorado and 29 per cent in a southern California coastal mountain area. Contrary to the widely quoted opinion, the increase in run-off is not confined wholly to flood periods. In both the Wagon Wheel Gap area and in the southern California area 52 per cent of the increase occurred during the nonflood period, when the flow is derived from subsurface storage. The increase during nonflood periods results from either increased subsurface flow and storage, or decreased transpiration, or a combination of both.

In the Wagon Wheel Gap area there was an average increase of 46 per cent in maximum daily discharge after deforestation, due to increased subsurface flow. In the southern California area the four storms occurring during the first year after the fire resulted in an increase of 1,700 per cent in the maximum daily discharge. The removal of vegetative covering clearly increases normal flood height. It is concluded to be a fallacious belief that forests or vegetative covering will increase summer run-off and shorten the low-water period through the exercise of storage functions.

Coincident with the increase in summer run-off there was an increase in the average summer minimum, and the period of low-water run-off was considerably shortened. In the Wagon Wheel Gap area the average minimum was increased about 12 per cent and the time of occurrence delayed about 5 days. In the southern California area the average minimum was increased more than 400 per cent, and the time of occurrence was delayed about 30 days. Deforestation made no appreciable change in the low flows which occurred during the winter in the Wagon Wheel Gap area, where there was practically no evidence of erosion after deforestation, because there was little direct surface run-off either before or after deforestation. In the southern California area complete denudation increased erosion as a direct result of the increased surface run-off.

The conclusion is drawn that in basins where shortages in water supply are becoming critical or where abnormal expenditures have been made to augment water supplies the maintenance of forests or reforestation for the conservation of water supply may have an effect exactly opposite to that desired.

Surface water supply of the United States, 1930, Part 3 (*U. S. Geol. Survey, Water-Supply Paper 698 (1932), pp. VIII+292, fig. 1*).—This report, prepared in cooperation with the States of New York, West Virginia, Ohio, North Carolina, Virginia, Kentucky, Indiana, Illinois, and Tennessee, presents the measurements of flow made on streams in the Ohio River Basin during the year ended September 30, 1930.

Water-power resources of the Rogue River drainage basin, Oregon, B. E. JONES, W. OAKEY, and H. T. STEARNS (*U. S. Geol. Survey, Water-Supply Paper 638–B (1932), pp. VI+35–97, pls. 23, figs. 10*).—Data are presented on the water-power resources of a drainage basin of 5,080 square miles in southwestern Oregon.

The rated capacity of turbines and water wheels installed at eight constructed plants in the Rogue River Basin is 59,800 h. p. The total potential power on the Rogue River and the Illinois River amounts to 558,000 h. p. for 50 per cent of the time and 188,000 for 90 per cent of the time with the natural flow of the stream, and to 575,000 for 50 per cent of the time and 455,000 for 90 per cent of the time with the flow regulated by the four proposed reservoirs.

Practical information for beginners in irrigation, S. FORTIER (*U. S. Dept. Agr., Farmers' Bul. 864, rev. (1932), pp. II+37, figs. 33*).—This is a revision by M. R. Lewis of this publication (E. S. R., 38, p. 186).

[Irrigation and drainage investigations at the Utah Station] (*Utah Sta. Bul. 235 (1932), pp. 55, 59, 71–73, fig. 1*).—The progress results are presented of studies on the composition of the principal irrigation waters of Utah, underground water supplies for irrigation, factors which influence the reclamation of water-logged and alkali land, and the relationship of stream discharge to precipitation with special reference to forecasting the supply of water for irrigation from seasonal surveys of snow cover on mountain watersheds.

A further note on soils regarding their suitability for making irrigation works exposed to water, J. CHARLTON (*Agr. and Livestock in India, 2 (1932), No. 3, pp. 290–296*).—In a further contribution to the subject (E. S. R., 66, p. 472), the results of studies on the coefficient of dispersion of six kyatti soils from irrigation structures are reported. The coefficient of dispersion is the ratio of the dispersion of clay and silt in natural soil to the dispersion of clay and silt after exhaustive treatment of the soil with dilute neutral sodium salt solutions.

It was found that, from the point of view of suitability of the soil for making engineering works exposed to water, not only is the coefficient of dispersion important but the total amount of clay and silt is likewise very important. The tendency toward kyatti formation may be measured by the product of a function of the dispersion coefficient and the amount of clay and silt present.

It is considered likely that when an amount of replaceable sodium is present in a soil greater than from 4 to 5 milli-equivalents per 100 g of air-dry soil, the soil is likely to give trouble when used for irrigation works exposed to water.

Soil-loading test practice in Europe, K. TERZAGHI (*Engin. News-Rec., 109 (1932), No. 6, pp. 158, 159*).—The author describes and appraises the apparatus and methods devised by European engineers for determining the ability of soils to carry foundation loads.

Foundation soil overloading shown by penetration test, H. K. STEPHENSON and E. B. FEINGOLD (*Engin. News-Rec., 109 (1932), No. 6, pp. 161, 162, figs. 3*).—In a contribution from the University of Michigan, a practical application of the principles of soil mechanics is described.

Compressibility of clay increased by remodeling, A. CASAGRANDE (*Engin. News-Rec., 109 (1932), No. 6, pp. 159–161, figs. 5*).—In a contribution from the U. S. D. A. Bureau of Public Roads, a description is given of tests conducted at the Massachusetts Institute of Technology which showed an increase of compressibility of remolded clay compared with the same clay in the undisturbed state.

The opinion is reached that a foundation in clay must be designed so that for any possible stress distribution no harmful differential movements can occur. This means that the foundation should be rigid enough to prevent any appreciable bending. A foundation slab alone can not accomplish this in an economical way. In order to make a raft foundation rigid enough and at the same time not excessively heavy, it must be designed as a truss, combining as its members the whole basement.

The Rothamsted pachimeter, R. K. SCHOFIELD and G. W. S. BLAIR (*Jour. Soc. Chem. Indus., Chem. and Indus., 51 (1932), No. 10, pp. 205, 206, fig. 1*).—

In a contribution from the Rothamsted Experimental Station, a laboratory machine is described and illustrated which is designed to measure the physical and dynamic properties of plastic materials such as soils, wheat flour doughs, and the like. Its primary function is the measurement of shearing strength, although apparently it may be modified to measure other properties such as plasticity, viscosity, and elasticity.

A piece of plastic material is made into a cylinder of known radius and length. This is placed between two plates, the upper of which is fixed to one end of a long horizontal beam. The beam is pivoted at the other end and thus allows the plate free vertical movement. The lower plate is moved to and fro with sufficient amplitude to cause the test cylinder to turn at least one complete revolution. It is found that no permanent lengthening (and simultaneous thinning) occurs unless the upper plate is exerting more than a certain critical stress on the test cylinder. The machine is designed to measure this stress.

Building framework and foundations of different materials and corresponding space inclosures, R. ROHN (*Tragwerk und Raumabschluss eine Zusammenfassung Heutiger Konstruktionsmöglichkeiten des Hochbaues in Holz, Stein, Eisenbeton und Eisen. Thesis, Eidg. Tech. Hochsch., Zürich, 1931, pp. [4]+145, pls. 22*).—This book deals with lumber, natural and artificial stone, reinforced concrete, and steel as primary building materials, with particular reference to their structural strength and relative space requirements.

The corrosion of steel by breeze and clinker concretes, F. L. BRADY ([*Gt. Brit.*] *Dept. Sci. and Indus. Research, Bldg. Research, Spec. Rpt. 15 (1930), pp. IV+15, figs. 4*).—The results of studies are reported which show that concretes in which breeze and furnace clinker aggregates are used cause the rusting of steel reinforcement. The degree of corrosive power of a variety of aggregates tested increased with increasing sulfur content. Probably as a result of their adsorptive powers, breeze and clinker aggregates promote rusting of steel, even under dry indoor conditions.

Owing to the physical structure of breeze and clinker aggregates, concrete containing them is usually rather porous. This allows ready access of moisture and oxygen and so permits rapid rusting. The permeability is not, however, the prime cause of the corrosion. A degree of permeability of ordinary concrete which would not allow early rusting of steel will, if resulting from the use of breeze or clinker containing sulfur, cause rapid corrosion. The substitution of sand for the finer part of coal residue aggregates reduces rusting.

The only clinker which when used in 1:6 concrete did not cause the rusting of steel in six weeks under moist conditions was a well-fused clinker, low in sulfur, of unusually high quality, from which all the fines were removed and replaced by sand. When the fine aggregate was not removed corrosion occurred.

The investigation is considered to prove the undesirability of using coal residues as aggregates in concrete reinforced by or in contact with steel. Though the tests do not quite exclude the possibility that the very best qualities of clinker, used only as coarse aggregate, might be harmless, the suitable clinkers are so rare and the conditions under which they have been shown not to cause rusting in a limited period are so restricted as to justify a general prohibition.

Public Roads, [September, 1932] (*U. S. Dept. Agr., Public Roads, 13 (1932), No. 7, pp. 105–120+[2], figs. 35*).—This number of this periodical contains the current status of Federal-aid road construction as of August 31, 1932, and the following articles: Static Load and Impact Tests of Lightweight Bridge Floor Slabs, by L. W. Teller and G. W. Davis (pp. 105–120); and Bituminous Concrete on Connecticut Avenue Experimental Road (p. 120).

Electricity on New England farms, II, W. T. Ackerman (*New Hampshire Sta. Bul. 266 (1932), pp. 54, figs. 9*).—This is a progress report of investigations on seven experimental farms in New Hampshire carried on by the station in cooperation with the National and New England Committees on the Relation of Electricity to Agriculture (E. S. R., 57, p. 283).

The analysis of total load developed by all the experimental farms shows 31.2 per cent to be very desirable, 48.3 per cent desirable, and 20.5 per cent undesirable in the effect on the power factor of central stations. The better quality of electric load on farms, i. e., developing the greatest kilowatt-hour use in midsummer, is particularly influenced by such factors as a greater balance of use on the farm than in the home, the use made of refrigeration in the house and for milk and other products, the use of the combination range, booster type water heaters, and portable motors. This type of equipment accounted for 31.2 per cent of the total current used over the 5-year period.

Equipment developing 20.5 per cent of the total load, and concentrated in the winter, comprised lighting and poultry farm appliances such as incubators and brooders. That part of the load having negative qualities, i. e., contributing even bulk without seasonal characteristics, is responsible for 48.3 per cent of the total and comprises the largest number of appliances.

During the height of experimental activities a maximum increase in current used of 853 per cent was made on one farm over previous records. The average increase in kilowatt-hour consumption for all farms ranged from 0 to 466 per cent but averaged 288 per cent for the 5-year period. The average concentration of equipment was 65 per cent in the household and 35 per cent on the farm. In 1925, 36 to 280 kw hours was the range in monthly consumption with an average of 141 kw hours. By 1930 the average of all farms had reached 48 kw hours.

The farm electric load is continuing to steadily and normally increase rather than decrease. The limits of use in the farm home are easily discerned, but the development of electric power in farm operations is considered as being only well started. Dairy and fruit farms have shown the most desirable characteristics from the standpoint of quality of load. Increased volume of use has in most cases benefited the farm operator by making him eligible to lower rates. The trend of the scheduled rates of the utilities has progressed steadily in a downward direction.

Standing demand charges per horsepower on portable motors have been found to discourage their use. Single meters with combination rates have proved more desirable to farmer and utility alike than the multimeter method.

Methods of artificially lighting winter layers, I. W. Rhys and R. T. Parkhurst (*Rural Electrif. and Electro-Farming, 7 (1932), No. 84, pp. 367–369, fig. 1*).—The results of experiments conducted at the Harper Adams Agricultural College are reported in which two lots of early and late hatched White Leghorn pullets were tested under lights.

The experiment showed that late hatching pullets when electrically lighted during the winter months responded to the treatment and gave better production and profit over food and lighting than unlighted pullets. The experiment also showed that satisfactory inexpensive devices could be arranged for automatically regulating the lights, that a reasonable allowance of artificial lighting had not injured the health of the birds, and that food consumption and body weight were materially increased by the use of electric light.

It was found that morning and evening lighting not only increases production but has an advantage in its convenience.

Electric hotbeds and propagating beds, F. E. Price and C. J. Hurd (*Oregon Sta. Bul. 307 (1932), pp. 29, figs. 13*).—A discussion is given of the construction and operation of electrically heated beds for starting vegetable

plants for transplanting and for the propagation of plants and shrubs from cuttings.

The power consumption for outdoor electric hotbeds of fairly tight construction, with good drainage and covered with glass, is estimated at 0.5 to 0.7 kw hour per square yard per day for fall and spring operation and 1.0 to 1.5 for winter operation in western Oregon when maintaining a soil temperature of from 65 to 70° F.

The cost of heat to maintain a temperature of from 65 to 70° in a 6 by 6-ft. electric hotbed was found to be $1.80 to $2.50 per month during the spring with electricity at 3 cts. per kilowatt hour. The electric hotbed was found to have many advantages over the manure hotbed.

The installation of the electric soil-heating cable is done in the same way for a propagating bed as for an electric hotbed. A metal tray 30 by 40 in. with a 200-w heating element strung open under the metal floor of the tray is recommended for small propagating bed or hotbed installation. This device is equipped with an adjustable thermostat and ordinary lamp cord and may be plugged into a 120-v outlet.

The power consumption for electrically heated propagating benches operated in a greenhouse maintained at an average temperature of 59° was found to be approximately 0.8 kw hour per square yard per day by the bed held at 70° and 1.5 by the bed held at 80°. Propagating beds constructed like electric hotbeds and heated with electric soil-heating cable during the winter months operated at temperatures approximately 10° less than the beds in the greenhouse with the same power consumption.

It was found that propagating benches should have 8 to 12 in. of sand or other medium over the electric heating cable for good temperature distribution.

The theory of the cold-frame, G. W. Todd (*Univ. Durham Phil. Soc. Proc., 8 (1931–32), No. 5, pp. 390–409, figs. 8*).—The object of this paper is to develop a mathematical expression of the relation between uncovered soil temperature and glass-covered soil temperature in terms of the radiation incident on the earth's surface and to calculate from it the temperatures likely to be attained in a coldframe or unheated greenhouse. The statement is made that the method developed can be used to test the relative values of other transparent materials when used as greenhouse coverings.

The manufacture of anhydrous alcohol and its use in internal-combustion engines [trans., title], A. Wiehe (*Rev. Agr. Maurice, No. 63, (1932), pp. 96–113, pls. 2*).—Data and information are presented on methods of manufacture of absolute alcohol from molasses and other materials and on its use in internal-combustion engines.

On the formation and dispersion of oil sprays, K. J. DeJuhasz, O. F. Zahn, jr., and P. H. Schweitzer (*Penn. State Col., Engin. Expt. Sta. Bul. 40 (1932), pp. 94, figs. 55*).—Studies are reported the main object of which was to establish the dispersion characteristics of fuel oil sprays employed in fuel-injection engines.

A number of experiments with various liquids were made, injecting them into atmospheric air. By observing the break-up distance the effect of several factors on spray formation was determined. For the experimental determination of the droplet sizes the spray was caught in a nonmiscible liquid medium. Microphotographs of specimens with 200 magnification permitted measuring the globule diameters, and from a count of the number of various size droplets their relative frequency was determined.

The volumetric distribution of oil sprays under predetermined operating conditions was determined by the dispersion rack, which is a skeleton placed in a pressure chamber holding a number of blotting paper pads for the inter-

ception of parts of the oil spray. The spray patterns so obtained with varying oils, injection pressures, air pressures, and orifice dimensions are presented by the use of the flux lines, which offer a graphic and convenient means to compare spray patterns and judge their dispersion.

It was found that in general the dispersion of a spray issuing from a circular orifice can be represented by a bell-shaped flux curve, resembling a curve of probability, having the densest portion in the axis of the spray, which is enshrouded in coaxial cones of diminishing flux values. Under certain circumstances, the flux curve shows a rather flat top or even a crater-like depression in its central portion.

The dispersion in a given cross section becomes more even (1) as the distance from the orifice is increased, (2) as the air density is increased, (3) as the oil viscosity is decreased, and (4) as the oil pressure is increased. On the evenness of the distribution the factors enumerated have an influence approximately in the order given, i. e., factor (1) has the greatest and factor (4) the least influence.

A larger percentage of the total spray reaches a given cross section (1) as the distance is decreased, (2) as the air density is decreased, (3) as the oil viscosity is increased, and (4) as the oil pressure is decreased (within the limits of investigation). No definite influence of orifice dimensions was noticeable in using cylindrical orifices of the dimensions employed.

Four appendixes are included dealing with mechanism of disintegration, the spray dispersion as a phenomenon of probability, practical suggestions with regard to spray dispersions in fuel-injection engines, and literature on liquid jets, sprays, and nozzles, especially for oil engines.

Pinking in internal combustion engines, K. Schnauffer (*Fuel, 11 (1932), No. 8, pp. 298–302, figs. 9*).—In a contribution from the German Aircraft Experiment Station, laboratory studies are cited which indicate that in an internal-combustion engine that is not pinking the flame propagates from the spark plug with a speed that is almost uniform. When pinking occurs the whole of the unburned portion of highly compressed gas mixture ignites spontaneously after reaching the self-ignition temperature. Due to the simultaneous inflammation of a large part of the gas mixture, large increases of temperature and pressure occur. The energy transformation is so direct, that is, it occurs so rapidly, that large local pressure differences occur which equalize with the speed of sound. In normal combustion a uniform pressure prevails owing to the low speed of propagation of about 25 m per second.

The intensity of the pinking depends on the amount of unburned gas mixture remaining when pinking is set up and on the composition (fuel-air ratio) of the mixture. As a measure of pinking, one can either take the measured direct pressure increase at the pinking center, or determine the mixture ratio that will give simultaneous inflammation. Due to the large local pressure differences during pinking, it is not immaterial at what position the recording of the pressure takes place.

In addition to the main form of pinking, there are also three other forms of pinking which may easily be differentiated from one another by means of the pressure records. The ionization current increases when pinking occurs due to the increased temperature. This increase can amount to several hundred per cent.

When pinking is absent, after-burning occurs until the exhaust valve opens (flame is projected through the open exhaust valve). With intense pinking, the combustion is so rapid that after-burning does not occur (no flame projected). If the amount of gas inflamed simultaneously is very large then, due to the expansion of this burning gas mixture, a high negative speed of propagation occurs.

Bearing lubrication, A. S. T. THOMSON (*Jour. Roy. Tech. Col. [Glasgow], 2 (1932), No. 4, pp. 638–656, figs. 12*).—The results of experiments with an oil ring bearing are reported, and a method of measuring oil film thickness is described. During the experiments the effects of variations in load, speed, and temperature were observed on the value of the coefficient of friction, and a series of tests was conducted with four standard automotive engine lubricating oils.

The bearing machine consisted essentially of a double ring oiler bearing 5 in. long and a load carriage mounted on a 2.5-in. shaft. The bearing pressure is varied by a set of movable weights, and the machine is driven in either direction by means of a variable gear. The loaded half of the bearing is bedded to the shaft over an arc of about 120°.

It was found that as the load is applied on the top of the bush the slits for the oil rings are on the loaded side of the brass. This is rather a serious defect as the oil is being fed to the journal at the point of maximum pressure. The result is a tendency to poor lubrication at high loads. Throughout the tests this is evident, as at high loads a sudden abnormally large reading of friction torque may be obtained indicating a state of semiboundary or greasy lubrication. These occasional false readings are obviated by moving the loaded bearing backward and forward along the shaft before taking a reading, thus insuring the formation of a viscous oil film.

With the circular loads in position on the bottom carrier, the center of gravity of the system is lowered and hence the machine is not so sensitive to a small addition in the friction torque weights. Higher bearing pressures could have been obtained by a system of levers. The existing bearing is not suitable for the insertion of several thermocouples due to the position of the ring slits and projections in the bearing housing. A reversing gear would be an advantage, as it would considerably speed up the taking of readings at low speeds.

The machine is not sufficiently rigid for accurate oil film thickness determinations. For attitude and eccentricity determinations a very short rigid shaft, 5 in. in diameter with bearings 12 in. apart, would be more suitable. The experimental values of the coefficient of friction obtained appeared to be rather large for conditions of pure fluid friction.

The four standard lubricating oils were tested in the experimental bearing machine and also in a Deeley oiliness machine and in a Boult oil tester, the last being used for an endurance test. The oils showed no great difference in viscosity and sufficiently low pour points for normal working conditions. On being tested for oiliness after heating to 200° F. and cooling, no change was apparent in the static friction of any of the oils.

There was some variation in the loss of efficiency of the four oils after use, which it was found was not due to high temperature alone. This was attributed not only to the intermingling of grit and dust with the oils but to the partial oxidation of the organic portion of the oil, due to rapid shearing at high temperature. It also was found that at low temperatures the coefficients of friction varied approximately with the viscosities of the oils. The speed required to reach the minimum value of the coefficient of friction varied to some extent with the oiliness factor of each oil.

Journal-bearing friction in the region of thin-film lubrication, S. A. and T. R. MCKEE (*S. A. E. [Soc. Automotive Engin.] Jour., 31 (1932), No. 3, pp. 371–377, figs. 13*).—Studies conducted at the U. S. Department of Commerce, Bureau of Standards, are reported.

Tests made in a 4-bearing machine, using both high-tin babbitt and high-lead bronze bearings and operated on lubricants of various viscosities over a wide range of speed and load, showed conclusively that the coefficient of friction

depends directly upon the viscosity even in the thin-film region. They indicated definitely that the friction coefficient is more likely a function of $ZN/\sqrt{P}$ than of ZN/P. It was found also to depend upon the metal of which the bearing is constructed, whereas in the region of thick-film lubrication the coefficient of friction is independent of the composition of the bearing metal. Z is the absolute viscosity of the lubricant, N the speed of the journal, and P the bearing pressure.

Rules for tractor testing [trans. title] (*Technik Landw., 13 (1932), No. 4, pp. 82–86, figs. 7*).—In a brief contribution from the Agricultural Academy of Berlin, a summary is given of the main features of regulations governing tractor testing which are proposed to meet German agricultural conditions. These are compared in some respects with the tractor-testing procedure used at the Nebraska Experiment Station, and data are presented showing their use on a wheel tractor of German make.

Drilling with the tractor [trans. title], W. Schirmer (*Technik Landw., 13 (1932), No. 4, pp. 71–73, figs. 3*).—A brief comparison of grain drilling with horse and tractor power indicates that the greatest advantage of tractor power for this purpose, under German conditions, lies not so much in the cost saving as in the volume of accomplishment per unit of time, thus taking full advantage of weather conditions favorable for seeding.

An inexpensive machine for filling the trench silo, E. G. Diseker (*Alabama Sta. Circ. 61 (1932), pp. 7, figs. 3*).—A small power feed cutter without blower is described and illustrated, and test data are reported. The latter indicate that the cutter has sufficient capacity for filling a trench silo, and that a 4-h. p. gasoline engine furnished ample power to operate the machine at its maximum capacity of 40 tons of silage per day. The cutter is said to cost about $30. Suggestions for its operation and care are included.

The smokiness of oil-burning orchard heaters, W. R. Schoonover and F. A. Brooks (*California Sta. Bul. 536 (1932), pp. 67, figs. 42*).—The results of tests to determine the smokiness of oil-burning orchard heaters are reported. These showed that different heaters vary greatly in smokiness, and that it is possible to burn ordinary grades of fuel oil in simple, inexpensive heaters without producing visible amounts of smoke at normal burning rates. Furthermore the smokiness of many types of heaters can be reduced by proper regulation and frequent cleaning. It was also found that the composition of fuel oils available commercially has no consistent influence on the smokiness of different heaters. Laboratory tests run at summer temperatures were found to be a reliable indication of the relative smokiness of heaters as operated in the field during the winter.

Descriptions of the experimental apparatus and methods and of the method developed for correlating light interception and weight of smoke particles are appended.

AGRICULTURAL ECONOMICS AND RURAL SOCIOLOGY

Agriculture of the American Indians, E. E. Edwards (*U. S. Dept. Agr., Library, Bibliog. Contrib. 23 (1932), pp. XI+89*).—This is a classified list of annotated references with an introduction describing the contributions of the aboriginal American Indian in the way of agricultural plants, methods, and processes.

Present-day agriculture in Arizona (*Arizona Sta. Bul. 141 (1932), pp. 40, figs. 14*).—This bulletin was prepared by the station staff chiefly for use in answering inquiries regarding farming conditions and livestock growing in Arizona. The climate, soils, irrigation, field crops, seed growing, horticulture,

plant and animal diseases, insect pests, beekeeping, economic native plants, and the livestock, dairy, and poultry industries of the State are described.

An economic study of farm organization in the Piney Woods farming area of Texas, C. A. BONNEN, B. H. THIBODEAUX, and J. F. CRISWELL (*Texas Sta. Bul. 453 (1932), pp. 51, figs. 20*).—The purpose of this study, made in cooperation with the Bureau of Agricultural Economics, U. S. D. A., is to provide basic information to assist farm operators in the area, which comprises 23 counties in northeastern Texas, in making the adjustments in farm organization that promise maximum profits. The basic data were obtained from detailed farm accounts kept on farms in Smith, Gregg, and Harrison Counties, being 18 in 1928 and 9 in 1929. These were supplemented by data from enterprise survey records obtained in 1930, soil survey, weather, and market movement and price reports of the U. S. Department of Agriculture, Bureau of the Census reports, and published and unpublished reports and information available at the Texas Station. The soils, topography, climate, natural vegetation, and general types of farming in the area are described.

Tables and charts are included and discussed showing (1) for each of the nine farms from which records were obtained in 1929 the financial and physical organization, the crop production, and farm income; (2) the man-labor and horse-work requirements per acre and the usual seasonal distribution for different operations in growing, harvesting, and marketing cotton, tomatoes, watermelons, peas, sweetpotatoes, corn, cowpeas, oats, sorghum, and Bermuda grass; (3) the monthly distribution of man-labor requirements per animal unit for work stock, cattle, swine, and chickens; and (4) the monthly car-lot shipments of tomatoes, watermelons, and sweetpotatoes from the Piney Woods area, Texas, and competing States. Other tables and text show the normal yields and labor and material requirements for feed crops; normal production and requirements for work animals, milch cows, swine, and chickens; estimated building, machinery, fence, and overhead expenses for different crops and kinds of livestock; and the average, 1921–1929, prices of commodities purchased and sold by farmers. Comparisons are made of the organizations and estimated returns from farms handled under the five typical systems of farming. Detailed farm budgets are given for the cotton, cotton-tomato, and cotton-dairy systems, and the advantages and disadvantages of each system are discussed briefly.

The estimated farm incomes under the different systems are for cotton (28 acres), $272; cotton-tomato (cotton 20 acres and tomatoes 2 acres), $569; cotton-sweetpotato (cotton 23 acres and sweetpotatoes 5 acres), $457; cotton-watermelon-peas (cotton 20 acres, watermelons 4, and peas 10 acres), $459; and cotton-dairy (cotton 20 acres and 10 cows), $565.

Economic study of New Hampshire poultry farms, H. C. WOODWORTH and F. D. REED (*New Hampshire Sta. Bul. 265 (1932), pp. 59, figs. 22*).—Data on details of management and costs were obtained by weekly or bimonthly visits to 23 specialized commercial poultry farms in southern New Hampshire ranging from an average of 354 to 2,548 layers. The period covered was the year beginning with August or September, 1929. Of the flocks, 19 were the New Hampshire strain of Rhode Island Reds, 2 White Leghorns, 1 Reds and Leghorns, and 1 Reds and Plymouth Rocks. The management of the flocks is described.

Labor incomes per farm ranged from —$726.67 to $8,342.36, averaging $1,399.05. Regular chore work on laying flocks ranged from 1.1 to 5.8 hours per hen, averaging 2.4 hours, and that in the production of pullets from 46 to 191 hours per 100 pullets, averaging 78 hours. The average per 100 birds varied from 491 hours for flocks of over 2,000 birds to 1,000 hours for flocks of less than 500 birds.

Weekly feed consumption per dozen eggs in individual flocks ranged from 7.04 to 11.11 lbs., for 15 pullet flocks, averaging 8.71 lbs., and from 8.57 to 13.74 lbs., averaging 11.96 lbs., for 6 old hen flocks. Mortality averaged 16.9 per cent. Depreciation and mortality losses on hens amounted to 10 cts. per dozen eggs produced. Pullets averaged 150 eggs per bird, and old hens 112 eggs. When price of eggs, egg size, and production were considered, early hatched pullets gave a higher return than late hatched pullets, and pullets a better gross return than old hens. Hatching eggs cost from 4.1 to 39 cts., averaging 11.1 cts. more per dozen than market eggs. Incubation cost averaged $1.86 per 100 chicks, and day-old chicks cost on an average $9.23 per 100. The average cost of producing pullets to an average age of 21.8 weeks was $131.23 per 100 for heavy breeds and $125.82 for producing Leghorns to an average age of 17.9 weeks.

As a rough statement of the cost of producing eggs, it was found that 17 lbs. of feed, 0.6 hour of labor, 4 cts. worth of supplies, and 13.7 cts. for overhead would produce 0.4 lb. broiler, 0.7 lb. fowl, 0.3 day-old chick, and 1 dozen eggs. On 18 heavy-breed farms, 237 day-old chicks with 3,596 lbs. of feed, 85 hours of labor, $18.83 expenses for overhead, and $10.67 for supplies produced 100 pullets and 210 lbs. of broilers.

Survey of land holdings in towns of Fremont and Boscawen, N. H., C. E. Walker and P. M. Hodgkins (*New Hampshire Sta. Bul. 264 (1932), pp. 19, figs. 3*).—The survey of the town of Fremont was made to obtain additional land utilization data and to test out the method previously noted (E. S. R., 65, p. 278) on a new problem. The survey for the town of Boscawen was made under the direction of the tax commission of the State to test the reliability of a method of making maps at a low cost. The two methods and also a card index system for keeping a permanent record of individual lots are described and illustrated.

Farm real estate taxes, 1913–1930, East North Central and West North Central States, B. W. Allin, D. Jackson, and J. L. Weston (*U. S. Dept. Agr., Bur. Agr. Econ., 1932, pp. 4, pls. 3*).—This is a mimeographed preliminary report including tables and charts showing, by years 1913–1930, the estimated real estate taxes per acre and the indexes of such taxes (1912=100) for Ohio, Indiana, Illinois, Michigan, Wisconsin, Minnesota, Iowa, Missouri, North Dakota, South Dakota, Nebraska, and Kansas.

Inequalities in taxation of farm lands and city property due to scope and method of assessment, L. P. Gabbard (*Texas Sta. Bul. 458 (1932), pp. 28, figs. 6*).—This study is based upon official reports and statistical studies; data from county records as to bona fide sales of farm and city real estate, assessed values, and total real estate taxes paid for periods of years in eight counties representative of the more important agricultural areas of the State; and information secured from owners of rented farms and city property as to gross rents, expenditures by owner, and taxes paid.

The amount of money on hand or deposit assessed for taxes, 1921–1929, averaged only 2.7 per cent of the amount of deposits in banks. The probate records studied showed that real estate constituted 48.6 per cent of the inventories, chattels 2.4, and intangible property 49 per cent, while the tax rolls of the counties showed that of the total assessed property valuation real estate constituted 70.8 per cent, chattels 25.8, and intangibles 3.3 per cent. Other reports studied revealed that while property is the source of only 20 to 25 per cent of the net income of individuals in the State, it is the source of 75 per cent of the State and local taxes. Assessment of individual properties showed gross inequalities. In one county studied assessments on 177 farms sold in 1929 varied from 15 to 118 per cent, averaging 34 per cent of the sales price, and

75 per cent of 917 farms sold in 1928 and 1929 in eight counties were assessed at from 11 to 50 per cent of the sales price. Similar inequalities were found for city property and for the percentages that taxes were of rent, both for farms and city property. The average percentage of assessed value to sales price in the eight counties ranged from 15.7 to 46.8, resulting in great inequalities in the State ad valorem tax. There was a decided tendency to assess large properties, both farm and city, at lower rates than small properties. Of the 917 farms sold in 1928 and 1929, those selling for an average of $9,000 to $10,000 were assessed at 20 per cent or less of their sales price, while those selling for an average of $2,000 to $3,000 were assessed at 50 to 70 per cent. On the farms with rent averaging about $800, from 1 to 20 per cent of the rent was absorbed by taxes, while on farms with rent averaging from $250 to $350, 50 to 80 per cent was absorbed. Similar conditions, both as to assessments and rent, existed for city real estate.

Suggestions made for remedying the inequalities are to (1) substitute a personal income tax for taxes on intangible personal property and use the revenue to replace an equal amount of general property taxes, (2) select county assessors on the basis of competitive examination under Civil Service rules, (3) provide for central control and supervision of assessments by a commission or commissioner, and (4) place much greater emphasis on the technic of assessing individual properties by requiring an assessment at full market value or a definite fraction of such value, by providing county soil maps locating the major soil areas, by recognizing earning capacity of property, and by keeping complete records of current real estate sales and a card index of each taxable and tax-exempt piece of property.

Effect of the seasonality of agriculture on Iowa banking, F. L. Garlock (*U. S. Dept. Agr., Bur. Agr. Econ., 1932, pp. [2]+20, figs. 9*).—This mimeographed preliminary report "describes the character of the seasonal demands upon country banks in Iowa and the way in which these demands have been met." It is one of a series of studies of the relationship between country banking practice and various types of agriculture. Most of the discussion applies to the period 1914–1923. It is based mainly on monthly data obtained from 20 banks in small towns and cities in various parts of the State. Where possible, comparisons are made with data from country and reserve city national banks of the State.

The trend of wheat production in Ohio, C. A. Lamb (*Ohio Sta. Bul. 507 (1932), pp. 21, figs. 6*).—Tables, charts, and maps are included and discussed showing the six main soil areas of the State; the average yield of wheat, by counties, 1920–1929; and for each soil area, by 10-year periods, the total improved land in farms, average acreage of wheat harvested, percentage of improved land in wheat, average total and per acre production of wheat, 1850–1929, the trends in improved land, 1880–1920, the acreage of wheat harvested, 1850–1929, percentage of improved land in wheat, 1880–1889 to 1920–1929, and the average yield of wheat per acre, 1850–1859 to 1920–1929. The future of wheat production in the State is discussed briefly.

Local marketing of high protein wheat in 1931, H. H. Finnell ([*Oklahoma*] *Panhandle Sta., Panhandle Bul. 42 (1932), pp. 11*).—Analysis is made of the premiums for high protein content received in 1931—the first year a serious attempt was made in the area to obtain premiums for protein content of wheat—by 85 farmers whose wheat had been tested by the station and found to possess premium value, that is, 12 per cent protein or more.

The total premium due—1 ct. per bushel for wheat with 12 per cent protein and 1 ct. additional for each 0.25 per cent of protein above 12 per cent—was $21,376.06 on the 278,509 bu. marketed. The total premium received was $15,-

268.16. Of the 85 farmers, 10.6 per cent received a price higher than the protein content of their wheat would justify, 32.9 per cent received full premium, 30.6 per cent part of the premium due, and 25.9 per cent received no part of the premium due. The losses of premium due to different causes were as follows: Selling before testing $2,764.80, storing before testing $570, insufficient quantity $21, no bid $1,649.27, and low bid $1,590.70. The excess premiums amounted to $487.87.

The lack of adequate and rapid laboratory service for making wheat analyses and inaccuracy in sampling are noted as the chief difficulties in the way of buying on protein content in the area.

Marketing Indiana potatoes; Local supply and imports, F. C. GAYLORD and H. M. CLEAVER (*Indiana Sta. Bul. 361 (1932), pp. 39, figs. 7*).—This bulletin is based on data obtained by personal interviews with potato growers, retail grocers, chain-store buyers, and wholesale produce dealers. In making analysis the State is divided into three areas. Tables and charts show the Indiana production and consumption of potatoes, by counties; percentage of retail sales produced locally; prices and yields of potatoes; percentages of growers' sales at the farm, to grocers, at wholesale, and by peddling; growers' practices as to selling in sacks or bulk and grading; dealers' attitude toward local potatoes as expressed by growers; retail and wholesale dealers' attitude toward local potatoes; retailers', wholesalers', and customers' preferences and retailers' and wholesalers' buying practices; and the quantities of local potatoes bought and sold by retailers.

Of the total estimated consumption of potatoes in the State in 1929, 37 per cent was produced within the State. Local-grown potatoes constituted 16.7 per cent of the sales of retailers and 2.2 per cent of the quantity distributed by wholesale produce dealers. Of the growers, 43 per cent sold mainly at the farm, 29 per cent to grocers, 12 per cent at wholesale, and 16 per cent by peddling.

The growers interviewed reported as follows: Difficulty in selling 13 per cent, grocers buying readily 88 per cent, objections to local potatoes 11 per cent, preference for local potatoes 50 per cent, potatoes sacked 24 per cent, potato growing profitable 91 per cent, potatoes hand graded 77 per cent, machine graded 17 per cent, and knowledge of U. S. grades 32 per cent. Home-grown potatoes were preferred by the customers because of cooking quality and shipped-in potatoes because of grade. In buying, 89 per cent of the retailers and 93 per cent of the wholesalers bought on a basis of U. S. No. 1 grade. Grade was the chief objection to local potatoes made by 49 per cent of the retail grocers. Of those buying local potatoes, 56 per cent stated that such potatoes were not graded, and 68 per cent were of the opinion that the local product did not meet U. S. No. 1 grade requirements.

Relation of central market prices of strawberries to production planning, O. J. HALL (*Arkansas Sta. Bul. 275 (1932), pp. 54, figs. 13*).—This study is part of the national survey of strawberry production undertaken by several of the State experiment stations and the Bureau of Agricultural Economics, U. S. D. A. It is based chiefly on data obtained from the records of New York City wholesale dealers in 1926 and 1927 regarding State and district of origin of the fruit, date of sale, sale price, type of sale, gain or loss to dealer, number of crates, size of container, and cost of transportation and cartage. Other data regarding car-lot shipments and receipts of berries and prices on the New York City market, 1926–1929, were obtained from the U. S. Department of Agriculture publications and reports.

The relation of central market prices to production planning is discussed with charts showing the relation, by weeks for each year 1926–1929, of supply

and wholesale price in New York City, and the relation, 1918–1930, of car-lot shipments and farm price per quart in the second early strawberry States and in Arkansas. An appendix includes a comparison of prices as obtained from the sample of New York wholesalers used in the study and as given by the Federal Market News Service.

The daily average price per quart for strawberries in New York City was relatively high during the first months of the year and declined as larger supplies were received in April and May. When prices were high, the range both in all prices and for the bulk of sales tended to be wide relative to the range when prices were low. In 1926 and 1927, North Carolina, Maryland, New Jersey, and New York berries sold for higher average weekly prices than Virginia and Delaware berries. Prices of Arkansas berries compared favorably with those for berries from other States sold on the same day. Commission sales showed gains on an average for every day reported. Joint-account and f. o. b. sales showed high gains and losses on particular days. For all districts commission sales showed a higher average return to the wholesale dealers, but no one method of sale consistently showed either a higher or a lower daily average price per quart. Costs of transportation are higher from Arkansas to New York City than from Tennessee or North Carolina, but more favorable to Arkansas shippers to the upper Mississippi Valley, and to Cleveland, Detroit, and Chicago as compared with North Carolina.

The long-time trends in production and prices for the second early States and Arkansas showed that the favorable prices for strawberries in 1930 and 1931 caused an expansion in acreage that may lead to unprofitable prices. To obtain favorable returns efficient sales organizations, high quality fruit, regard to condition of pack, and concerted effort to adjust production to market requirements will be necessary.

The contract feeding of livestock, R. R. THALMAN (*Nebraska Sta. Bul. 274 (1932), pp. 44, figs. 14*).—This bulletin includes data to assist growers and feeders of cattle and sheep in making equitable contracts for "share" or "contract" feeding. The following important factors in contract feeding are discussed: An equitable contract, shrink, death loss, overhead costs, bonuses and deductions, feed costs and feeding methods, pork credit, total cost, types of contracts, and feeds. The data on feeds, feed requirements, daily gains, cost of gains, age, and sex of animals are based on experiments made by the station during the past 17 years. Specimens of contracts for gain-basis, gain-at-market-price, investment-basis, straight inventory, and custom feeding plans are included.

Car-lot shipments and unloads of important fruits and vegetables for the calendar years 1929 and 1930 (*U. S. Dept. Agr., Statis. Bul. 38 (1932), pp. 162*).—This bulletin supplements that previously noted (E. S. R., 63, p. 689). The tabulations show the number of carloads of 37 fruits and vegetables shipped during 1929 and 1930, segregated by States of origin and by months, and also the number of carloads of 19 of these commodities unloaded in 66 cities during the same years.

Crops and Markets, [September, 1932] (*U. S. Dept. Agr., Crops and Markets, 9 (1932), No. 9, pp. 321–368, figs. 3*).—Included are tables, charts, notes, reports, and summaries of the usual types, and also the fall wheat, feed, and hog outlooks for the United States.

Switzerland: A guide to official statistics on agriculture, population, and food supply (*U. S. Dept. Agr., Bur. Agr. Econ., Agr. Econ. Bibliog. 35 (1932), pp. IV+341*).—This publication consists of part 1, an annotated list of official publications, compiled by A. M. Hannay, and part 2, methods of collection and analysis of official statistics, by J. D. Black and F. Bachman.

Included in part 1 are the official publications of Switzerland in the library of this Department and the Library of Congress that contain agricultural statistics. Statistics of the separate cantons are not included except when found in the publications of the Confederation.

In part 2 "the official agricultural statistics of Switzerland have been compared with those of the United States. The principal method of testing comparability has been to tabulate the statistics of Switzerland and the United States in parallel columns and to work out various significant ratios from them, such as that between population and agricultural land. Those have been used as a basis for estimating the possible effects of differences in methods of collecting and analyzing the statistics, and for suggesting possible methods of reducing the existing data to a comparable basis and of collecting future statistics that will be comparable. In similar studies of other countries it is planned to make comparisons with the statistics of the United States, Switzerland, and still other countries. In each case, the results will be related to the methods employed by the country in collecting the data for the 1930 World Census of Agriculture." At the beginning of each section references are given to official sources of general population statistics, to important secondary sources of information, statistical or otherwise, and to discussions of methods of collecting and analyzing statistics.

Among other items the several sections cover the statistical organization of Switzerland; natural bases of agriculture; definition of agriculture; number of farms; farm labor; land utilization; ratios of population to land and of agricultural workers to land; crops and their acreage; livestock—classification, numbers, and amounts; ratio of livestock to land and to population and agricultural workers; crop yields and production; ratio of crop production to livestock; livestock production; combined agricultural production; ratio of agricultural production to agricultural workers and to land; forest products; food production and consumption in relation to the population; quantity of digestible nutrients produced and consumed in the United States and Switzerland; timber production and consumption in relation to population; budgets of farm families and urban families; imports and exports of farm and forest products; fertilizers—production, imports, exports, and use in agricultural production; power on farms; prices of farm products; value of agricultural production; agricultural income; land values; interest rates on loans to agriculture; wages of farm labor; and land tenure.

What Ohio farmers think of farmer-owned business organizations in that State, T. B. Manny (*U. S. Dept. Agr. Circ. 240 (1932), pp. 24*).—This bulletin summarizes and interprets the replies of 737 members and 635 nonmembers of Ohio farmer-owned business organizations in 14 counties concerning their experiences with and opinions of the work of such organizations.

Membership in farmer-owned business organizations was found to be distinctly selective in its appeal. Members as compared with nonmembers were characterized by better than average schooling, the operation of farms of 100 acres or more, more frequent memberships in social, civic, and church organizations, and more than average ability as producers. Prospective members were found to be less desirable material than present typical members. A little more than 10 per cent of the farmers interviewed appeared totally unsuited for membership in organizations involving considerable cooperation. A large majority of the members were well satisfied with the accomplishments of the organizations. The information services of many of the organizations did not seem adequate. The Ohio Farm Bureau Federation was found to have played a major part in the promotion, development, supervision, and, in some cases, in the management of the organizations. Membership tie-up between a general

farmers' organization and various commodity groups requiring members of the latter to join the former has not given permanent support to the general organizations and has introduced some very difficult problems for both organizations, and it appears that general organizations will serve their own long-time interests best by refraining from membership tie-ups with commodity groups and from entering directly into very many commercial activities.

This study was made in cooperation with the Ohio State University and the Federal Farm Board.

An economic study of cooperative buying and selling among farmers in Virginia, R. C. TALBOT (*Virginia Sta. Bul. 286 (1932), pp. 38, fig. 1*).—Data were obtained by the survey method from 70 cooperative organizations regarding volume of sales, methods of financing, accounts receivable and payable, operating expenses, membership, kind of business, law under which operating, etc. The trends in cooperative effort and the history and legal status of cooperatives in Virginia are described. The 1930 cooperative marketing law is analyzed and compared with the laws of other States. The types of cooperative purchasing and marketing organizations and the value and kind of supplies and produce handled, the price policy of the former type of organization and the pooling policies of the latter, the method of financing, and the effects of volume of business on efficiency of operation are discussed. Analysis for the purchasing organizations is made of capital efficiency as measured by inventory turnover, average daily sales outstanding in receivables, and turnover of total and of fixed assets, labor efficiency, and operating cost. The problems connected with the use of warehouses, methods of furnishing information to members, and accounting and auditing are also described briefly.

In 1930 $11,917,975 worth of Virginia farm products were marketed by cooperative organizations, and $7,513,508 worth of farm supplies were purchased through cooperative purchasing organizations. Truck crops constituted 57 per cent of the total value of products marketed; fluid milk, 27 per cent; livestock, 5 per cent; dairy products other than milk, 4 per cent; and apples, poultry and eggs, wool, and grain combined, 7 per cent. Of the value of supplies purchased, feed constituted 62.5 per cent; seed, 13.2 per cent; and fertilizer, 9 per cent. No other item exceeded 3 per cent.

Of the cooperatives (34) using permanent capital, 21 had a ratio of over 2 : 1 between current assets and current liabilities, 6 a ratio between 1 : 1 and 2:1, and 7 a ratio of less than 1:1. Twenty-seven of 36 cooperatives had a net worth and membership investment exceeding 50 per cent of the total capital; 7, between 25 and 50 per cent; and 1 each, less than 24 per cent and no net worth. The inventory turnover of 19 purchasing associations ranged from less than 5 times per year for 2 to 30 times and over for 3, averaging 17.6 times. Receivables outstanding ranged from less than the amount of 1 day's sales for 2 purchasing organizations to the amount of over 50 days' sales for 4 organizations, averaging the amount of 25.7 days' sales. The turnover of total assets was more rapid for associations renting than for those owning warehouses. The turnover of fixed assets (12 associations) varied from less than 5 to 42.9 times per year, averaging 17.8 times.

Sales per employee averaged $32,341 for the purchasing organizations in which feed, seed, and fertilizer constituted less than 50 per cent of the average sales and $47,618 for those in which these items constituted over 75 per cent of the average sales. Total expenses of 10 purchasing organizations in which 50 per cent or more of the volume of business was feed ranged from 2.4 to 12 per cent of the net sales, averaging 7.7 per cent. Of the 70 cooperatives studied, 21 had outside annual audits, 39 no audits, and 10 audits by local committees.

Growth and decline of farm trade centers in Minnesota, 1905–1930, C. E. LIVELY (*Minnesota Sta. Bul. 287 (1932), pp. 48, figs. 11*).—This study conducted during the year 1930–31 "is an attempt to understand the differentials in the growth and decline of Minnesota trading centers and to relate them to certain factors in agriculture and rural life." The sources of information were Federal census reports, the Minnesota State census of 1905, Bradstreet's Commercial Ratings, and special data of the division of agricultural economics of the University of Minnesota. The general trends in the number and population of and business units in Minnesota farm trade centers are discussed. Analysis is made of the differential growth and decline of such centers and of the relation of size and regional distribution of centers, tributary population, changes in wealth and income of the farm population, growth of improved transportation and communication facilities, presence of large cities and density of population, railroads, the decline in the number of rural post offices, and local factors to the differential growth and decline of the farm trade centers.

It was found that while the number of trade centers in the State increased from 1905 to 1930, there was a decrease in the older settled portions of the State. The real decline was in centers with a population of less than 500 people. With three exceptions, all cities of 1905 increased in population. Incorporated centers with populations of less than 2,500 people increased in number and population. Unincorporated centers declined 13.3 per cent in number, and those existing throughout the period studied remained practically stationary as to size. Centers with less than 5 business units declined more than five times as rapidly as did all centers with less than 500 population. Of all trade centers with less than 2,500 people in 1905, 50 per cent increased in size, 25 per cent declined, and 25 per cent remained stationary.

Of the 306 small centers disappearing as economic units during the period, 38 per cent disappeared in the period 1905–1910 and 23 per cent in the period 1910–1915. Of the 342 new economic centers, 37 per cent appeared in the period 1905–1910 and 27 per cent in the period 1910–1915. The most prominent factors resulting in the disappearance of centers were fundamental changes in tributary population, in industry, type of agriculture, transportation, marketing organization and buying habits, and to a lesser degree, social conflict. The most prominent factors resulting in the appearance of new centers were settlement of new territory, growth of population, establishment of new industries, and shifts in industry and transportation facilities.

The findings support those of similar studies in other sections that during the last 25 years farmers have become increasingly associated with larger trade centers for both economic and other purposes, and that centers with less than 500 people and particularly those with less than 5 business establishments have played a decreasing rôle in the economic and social life of the farmer.

Activities of churches in town-country communities, C. R. HOFFER (*Michigan Sta. Spec. Bul. 226 (1932), pp. 27*).—This is a more intensive analysis of the data for churches and their auxiliary organizations obtained in the study previously noted (E. S. R., 65, p. 88). Tables are included and discussed showing for each of the 10 communities the regularly scheduled meetings and total accumulated attendance at church services, Sunday school, and women's, men's, young people's, and junior organizations; the number of meetings, agency sponsoring the meeting, and average attendance; the total number of special meetings and the number of special meetings of churches and their auxiliary organizations and of other types of organizations per 100 population; number of kinds of events in the meetings sponsored by church organizations; number of times individuals participated in programs of churches and their

auxiliary organizations and the appearances per 100 population; number of times the accumulated attendance of town and country people exceeded the population of the country or town; and the total membership of the several churches and their auxiliaries and the percentages of such membership that were country people.

The average number of meetings per church was 162. Twenty-six different types of events were listed for the 415 special meetings held by the 47 churches during the year. The number of special meetings per community varied from 0.1 to 2.1 per 100 population. Special meetings sponsored by churches did not seem to affect adversely the activities of other institutions or organizations. Lectures or talks and vocal and instrumental music were the principal special features added to regular church or Sunday school programs. The programs of special meetings were more varied and often afforded opportunity for active participation on the part of persons attending.

Subjects of general interest rather than such as pertained to the immediate problems of the communities were emphasized. Of the total accumulated attendance at meetings, 68 per cent was town residents, although the country population constituted 58 per cent of the total population of the communities.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Training teachers in supervised farm practice methods, W. T. SPANTON (*Fed. Bd. Vocat. Ed. Bul. 165 (1932), pp. VII+125, pls. 8*).—"The purpose of this study is to discover the amount, kinds, and nature of preemployment training necessary to conduct supervised farm practice with all-day pupils that can and should be offered to prospective teachers by our recognized teacher-training institutions. . . . The procedure included the making of a complete analysis of activities performed by teachers of vocational agriculture in conducting supervised farm practice activities." This analysis was used as a check list of 79 activities and submitted to 40 State supervisors (3 also acted as teacher trainers), 46 teacher trainers (7 also acted as State supervisors), and 267 teachers, of whom 70 had only 1 year's experience in teaching vocational agriculture, 136 from 2 to 4 years, and 61, 5 years or more.

Charts are included and discussed showing the percentage of supervisors recommending, teacher trainers reporting, and first-year teachers receiving (1) no training, and (2) training through the lecture, the class discussion, the observation, the class practice, and the field practice methods for certain of the 79 activities; and the percentage of supervisors, teacher trainers, and teachers believing that certain of the 79 activities are adapted to preemployment training and that such training can be carried to the level of "doing ability."

The activities are divided into 10 major groups as follows: Investigating opportunities and facilities for supervised farm practice enterprises; explaining and securing interest in supervised practice enterprises; organizing supervised practice programs; advising pupils in project selection; assisting pupils in project planning; supervising projects; teaching project record keeping, accounting, and analysis; administrative activities; securing publicity; and project instruction. The importance, difficulty, adaptability to preemployment training, and extent to which training can be carried to the level of doing ability are discussed for each group, and the findings summarized and recommendations made for each activity.

The conclusions of the study and recommendations for improvement are summarized under the headings of organization of training content; teacher-training methods used by teacher trainers and recommended by State supervisors; the four criteria—importance, difficulty, adaptability, and doing level;

suggestions for using the evaluated activities; and fundamental principles upon which a preemployment training program should be based. A 5-year cadet, a modified cadet, and a 4-year apprentice practice plan of teacher-training organization are suggested.

The conference procedure in teaching vocational agriculture: Use of the conference in agricultural evening classes, A. P. WILLIAMS (*Fed. Bd. Vocat. Ed. Bul. 147, rev. (1932), pp. VII+38, figs. 2*).—This bulletin refers particularly to the use of the conference procedure in conducting evening classes with farmers. The general characteristics of the procedure are described. Suggestions are made regarding different tasks and problems of the teacher, and the common conference situations met with are discussed. The more important devices used and ways and means of securing desired conference results are described.

FOODS—HUMAN NUTRITION

The thirty-sixth report on food products and the twenty-fourth report on drug products, 1931, E. M. BAILEY ET AL. (*Connecticut State Sta. Bul. 341 (1932), pp. 695–737*).—Included among the routine analyses of foods and drugs submitted in this annual report (E. S. R., 65, p. 789) are proximate analyses of 19 samples of gluten bread, 5 of special breads and cereal products, 12 of mayonnaise, and 1 of tobacco seed. Reported analyses of the moisture content of dried apples, apricots, and peaches have been tabulated, with literature references. Special attention has been given to the examination of eggs with reference to grades and labels, to the determination of spray residues on apples, and to methods for analysis of salad dressings of the mayonnaise type.

In the section on drugs a brief summary by C. E. Shepard and Bailey is given of the service of the laboratory in the examination of materials for suspected poisons.

Nutritional studies of the food stuffs used in the Porto Rican dietary.—II, Proximate and ash analyses, C. L. CINTRÓN and D. H. COOK (*Porto Rico Jour. Pub. Health and Trop. Med., 7 (1932), No. 4, pp. 435–441*).—In continuation of the series noted on page 278, proximate and ash analyses are reported for 22 vegetable foods, all but 2 of which were grown in Puerto Rico. The Official methods were used for proximate analyses, calcium and phosphorus were determined gravimetrically, as outlined by Fales (E. S. R., 55, p. 205), and iron was determined in separate samples by a slight modification of the Kennedy method (E. S. R., 62, p. 789). The data are tabulated for proximate composition; calories per 100 g edible portion of protein, fat, and carbohydrate and per pound; and total ash, CaO, P_2O_5, and Fe in percentage of edible portion.

The foods tested, which are listed in the tables under their local Spanish names, are avocado (*Persea persea*), eggplant (*Solanum melongena*), squash (*Pepo moschata*), pigeon pea (*Cajan cajan*), chickpea (*Cicer arietinum*), apple and fig bananas (*Musa sapientum*), sweet corn root? (*Calathea allouya*), plantain (*M. paradisiaca*), white yam (*Dioscorea alata*), seed breadfruit and breadfruit (*Artocarpus communis*), red and green peppers (*Capsicum annuum*), ripe and green plantain, okra (*Abelmoschus esculentus*), yellow yautia (*Xanthosoma atrovirens*), white yautia (*X. sagittifolium*), and cassava (*Manihot manihot*).

"These foods so far analyzed, with the exception of two legumes, are low in protein, and all but aguacate [avocado] are low in fat. We seem to have no plants especially rich in calcium, and most of our native products contain relatively little iron; due to the high water content of such native products, they can not compete with the more concentrated foods such as rice, wheat

flour, corn meal, and dry legumes on a cost per calorie basis. However, some of them contain notable amounts of vitamin A, and they all can and should be utilized as welcome additions to our rather restricted diet."

Tenderness of meat.—I, Determination of relative tenderness of chilled and quick-frozen beef, D. K. Tressler, C. Birdseye, and W. T. Murray (*Indus. and Engin. Chem., 24 (1932), No. 2, pp. 242–245, figs. 3*).—Two objective methods of determining tenderness in meat are described. One of these makes use of a cutting or puncturing apparatus made from an ordinary Schrader tire pressure gage with a blunt instrument inserted. The other employs a modified penetrometer of the New York Testing Laboratory standard type for determining the consistency of bituminous materials.

Both instruments were used in determining the effect of quick freezing and subsequent storage on the tenderness of various cuts of grade B beef. Tests on the unfrozen meat showed that either method is sufficiently sensitive to distinguish between the tenderness of various cuts of meat. In all but one test there was a material tendering effect caused by the quick freezing and subsequent storage of the meat for one week at low temperature. On the average this amounted to approximately 20 per cent.

Preliminary results in a series of tests to determine the effect of prolongation of storage on the tenderness of meat showed a progressive increase in tenderness of grade A and grade C sirloin steaks for the period of storage, five weeks. This increase was more marked with the tough than with the more tender steaks. At the end of five weeks the grade C steak was as tender as the grade A steak prior to freezing.

The food value of milk (*Connecticut State Sta. Bul. 340 (1932), pp. 653–694, figs. 12*).—This extensive revision of the earlier bulletin of the same title (E. S. R., 42, p. 659) has been made with the assistance of J. P. Outhouse and B. Hall, the latter contributing the section on the cost and economy of milk.

A comparison of the two editions shows the remarkable increase which has taken place in the intervening 13 years in knowledge of the essential components of milk, as well as in the nature of the dietary deficiencies of milk. Considerable emphasis is given to these deficiencies, which are overlooked in many discussions of the food value of milk. Concerning the usual recommendation of 1 qt. of milk daily for each child, the statement is made that "if 1 qt. of milk be given, careful selection of other foods must be made in order to supplement the deficiencies of milk. As brought out in this bulletin, these deficiencies are calories, iron, and copper, and the vitamins other than A. Additional roughage is also advisable. Generous amounts of fruits and vegetables, both raw and cooked, egg yolk, glandular meats, cod-liver oil, and small amounts of whole cereal grains to supply calories make ideal additions to a diet built around 1 qt. of milk per day."

In the discussion of the cost and economy of milk, the contribution made by 1 qt. of milk to the dietary needs of a child is given graphically, with suggestions for supplementary foods yielding sufficient calories, together with other essentials to make a complete diet. With milk at 12 cts. a quart and staple food products at the low cost prevailing at the time of writing, the total cost of the diet for one day was estimated at 42 cts. "Bearing in mind the large nutritive contribution made by the quart of milk and the small fraction of the cost of the day's meals for which it may be procured, it is clear that milk may be regarded as a fundamental item of the child's diet and, in the true sense of the word, as an economical food."

Dried lactic acid milks as a long continued diet for infants, J. H. Hess, I. McK. Chamberlain, and L. S. Robins (*Jour. Amer. Med. Assoc., 98 (1932), No. 15, pp. 1250–1253*).—This is a clinical report of a long-continued comparison

of the value for infant feeding of several types of dried lactic acid milk with breast milk, Bulgarian cultured milk, fresh milk and lactic acid, and mixed feeding, the subjects consisting of a large group of infants under the supervision of the department of pediatrics of the University of Illinois College of Medicine. "The clinical results indicate that dried lactic acid milks can be used under the same conditions as cultured sweet milk and cow's milk plus U. S. P. lactic acid."

White House Conference on Child Health and Protection: Sect. II, Public Health Service and Administration.—Milk production and control (*New York and London: Century Co., 1932, pp. XVII+392, figs. 12*).—This is the complete report of the committee on milk production and control of the White House Conference on Child Health and Protection. A preliminary report of this committee has been noted previously (E. S. R., 66, p. 89).

The nutritive value of high vs. low calcium and phosphorus-carrying wheats (*Utah Sta. Bul. 235 (1932), p. 55*).—A brief summary is given of feeding experiments with rats on rations containing a high calcium-carrying wheat, Kota, and a low calcium-carrying wheat, Turkey. The observations included growth and bone and blood analyses for calcium and phosphorus.

The relation of maturity, size, period in storage, and variety to the speed and evenness of cooking of potatoes, M. C. LANCASTER and M. D. SWEETMAN (*Jour. Home Econ., 24 (1932), No. 3, pp. 262–268*).—The technic described previously (E. S. R., 66, p. 485) has been used to determine the effect of various factors on the speed and evenness of cooking of potatoes. The effect of maturity and length of storage was first determined by testing slices from tubers of modal size in potatoes of the Green Mountain variety dug at different dates and tested soon after being placed in storage and three months later.

The immature potatoes, or those dug at the earlier dates, cooked more evenly than those dug at later dates. Differences in the speed of cooking of stem and bud ends were found in all samples tested and were greater in the mature than immature potatoes. This offers an explanation for the greater evenness of cooking of the immature samples. The bud ends cooked more quickly than the stem ends, although this tendency disappeared somewhat on storage. The differences between the stem end and bud end were found to extend almost to the middle of the potato. For this reason it is suggested that in boiling large potatoes, especially new ones, it is a good plan to cut the potatoes in half transversely and cook the stem ends longer than the bud ends.

In a comparison of the speed of cooking of several varieties of potatoes of approximately the same size and maturity, the Irish Cobbler cooked more quickly than the other varieties, which included the Spaulding Rose, Bliss Triumph, Green Mountain, and Idaho Russett.

Buttercup squash: Its origin and use, A. F. YEAGER and E. LATZKE (*North Dakota Sta. Bul. 258 (1932), pp. 19, figs. 10*).—This bulletin describes the origin and development at the station of a new small variety of winter squash, the Buttercup, discusses its properties and composition, as shown by analyses, and gives general methods and special recipes developed for cooking and canning. Since each squash weighs only from 3 to 3½ lbs., it is well adapted to family use. Other advantages are that the rind is comparatively thin and easy to remove, the flesh is thick with very little waste in seeds and fibrous material, the flavor is mild and sweet, and the texture smooth and comparatively dry. Preliminary tests have shown the squash to be a good source of vitamin A and to contain vitamin B.

Correlations of analyses and baking tests indicated that the most important single factor affecting quality was dry matter content, and that this should not fall below 17 per cent.

The utilization by human subjects of the nitrogen, calcium, and phosphorus of the navy bean (Phaseolus vulgaris), with and without a supplement of cystine, M. S. PITTMAN (*Jour. Nutrition, 5 (1932), No. 3, pp. 277–294*).—Two series of metabolism experiments conducted on five adult women subjects are reported in which navy beans, served as a sieved purée or baked in amounts varying from 113.8 to 163.1 g a day, furnished from 90 to 94 per cent of the nitrogen, 80 to 85 per cent of the calcium, and 84 to 95 per cent of the phosphorus of a simple diet calculated to furnish 80 per cent of the Sherman minimum standard of 44.4 g per 70 kg of body weight. In the latter half of each series, cystine in the proportion of 2 per cent of the weight of the calculated protein was added to the diet.

The nitrogen intake ranged from 0.082 to 0.093 g per kilogram of body weight, a quantity found by Rose and MacLeod (E. S. R., 55, p. 790) to be sufficient to maintain a generous positive nitrogen balance when furnished by such foods as milk, bread and milk, and meat. The nitrogen balances were consistently negative on the unsupplemented bean diet, and were not strikingly altered by the addition of cystine, an amino acid lacking in bean proteins. The range in nitrogen balance on the noncystine diet averaged from —1.14 to —0.19 g and on the cystine diet from —0.35 to +0.4 g. In one of the subjects the difference between the cystine and noncystine periods was negligible.

The subjects were in slight negative balance throughout the experiment, although the diet furnished from 5.5 to 6.5 mg of calcium per kilogram body weight, a quantity found by Rose and MacLeod sufficient for positive balances in the case of carrots (E. S. R., 42, p. 760) but not of almonds (E. S. R., 50, p. 764). The phosphorus intake was low, ranging from 10.3 to 11.5 mg per kilogram of body weight. The phosphorus balances were negative, but there appeared to be slightly better utilization of the phosphorus coincident with better utilization of the nitrogen.

The author concludes that although navy beans can be eaten with comfort by healthy people in quantities at least as large as 4 oz. dry weight daily, they are not entirely satisfactory as the chief source of nitrogen in the diet.

Simplified tomato cocktail, R. A. WAIT (*Fruit Prod. Jour. and Amer. Vinegar Indus., 11 (1932), No. 11, pp. 332, 333, figs. 2*).—This article, although intended for the wholesale manufacturer, contains a formula for a simple tomato juice cocktail which might be suitable for home preparation. The formula consists of tomato juice 1 gal., salt 2.1 oz., sugar 4.4 oz., and powdered white pepper 26 g. or $\frac{1}{100}$ oz. The seasoning is added to the hot juice just before packing. In mixing, care should be taken not to agitate the juice, as entrapped air tends to destroy vitamin C.

Mineral composition of dates, M. M. CLEVELAND and C. R. FELLERS (*Indus. and Engin. Chem., Analyt. Ed., 4 (1932), No. 3, pp. 267, 268*).—Proximate and mineral analyses are reported for the edible portion of package samples of imported dates of the Hallowi and Sayer varieties purchased on the market.

The proximate composition was as follows: Moisture 19 (Hallowi) and 18 (Sayer) per cent, ash 2.22 and 1.59, protein (N×6.25) 1.72 and 2.16, fat (ether extract) 1.90 and 0.31, reducing sugars as invert 73.50 and none, total carbohydrates other than crude fiber 73.67 and 76.14, crude fiber 2.17 and 1.90 per cent, and sucrose none and none, respectively. Attention is called to the high percentage of sugar and to the fact that this is of the invert type, in contrast with that of the principal American-grown date, the Deglet Noor, which is of the cane sugar type.

The mineral composition is expressed as total ash on the moisture-free basis and the percentage composition of the ash calculated as oxides. The percentages of total ash in the Hallowi and Sayer varieties were 2.02 and 1.94 per

cent, respectively. The outstanding characteristic of the ash is considered to be the large proportion of potassium, 42.7 and 40.8 per cent, expressed as K_2O. The percentages of mineral elements usually taken into consideration in dietary analyses were CaO 4.51 and 6.96, P_2O_5 9.50 and 7.47, and Fe_2O_3 0.26 and 0.23 per cent, respectively. Copper was present to the extent of 0.015 and 0.014 per cent CuO. The alkalinity of the ash was high, the ash from 100 g of the edible portion being equivalent to from 13.6 to 14.7 c c of normal alkali. These values are lower than for spinach, raisins, and dried beans, but considerably higher than for lettuce, potatoes, tomatoes, oranges, lemons, and apples.

Pure fruit jelly juices, W. V. CRUESS and G. L. MARSH (*Fruit Prod. Jour. and Amer. Vinegar Indus., 11 (1932), No. 11, pp. 325, 326*).—A brief summary is given of methods which have been developed in the fruit products laboratory of the University of California for the commercial preparation of fruit juices containing a sufficient quantity of the natural pectin of the fruit to jell readily when heated with equal weights of sugar, as in ordinary home methods. The products include plum jelly and loganberry jelly juices and canned citrus marmalade juice as described previously (E. S. R., 47, p. 509). Observations are reported on the keeping quality of the juices packed in various ways.

Experiments on utilization of surplus apricots, G. L. MARSH and W. V. CRUESS (*Fruit Prod. Jour. and Amer. Vinegar Indus., 11 (1932), No. 11, pp. 334, 349*).—This contribution from the laboratory noted above describes various methods which have been developed for utilizing surplus ripe apricots. The products include canned apricot purée and canned crushed apricots, suitable for use in the home and commercially in ice creams and soda fountain drinks, and canned pickled apricots.

Bacteria, yeasts, and molds in the home, H. W. CONN, rev. by H. J. CONN (*Boston and London: Ginn & Co., 1932, 3. rev. ed., pp. VIII+320, pl. 1, figs. 83*).—The principal changes noted in this revision of a well-known handbook on household microbiology are the introduction of a brief historical section and new material on refrigeration, canning, and the spread of disease.

Ultra-violet rays prevent molding of bread, W. L. OWEN (*Food Indus., 4 (1932), No. 6, pp. 208–210, fig. 3*).—Attention is called to the fact that mechanically sliced bread molds more rapidly than bread in the loaf. This is attributed to the fact that the saws continually take mold spores from the surface to the interior of the loaf. Exposing the bread slicing unit to ultra-violet light during the slicing operation has been found successful in preventing the development of mold. The light sterilizes the saws and inactivates the mold spores on the surface of the bread.

Studies in nutrition: An inquiry into the diet of families in Cardiff and Reading, E. P. CATHCART and A. M. T. MURRAY ([*Gt. Brit.*] *Med. Research Council, Spec. Rpt. Ser. No. 165 (1932), pp. 28, figs. 3*).—This investigation, which was carried out by the authors with the assistance of M. Shanks along the same lines as an earlier one on a fairly well-to-do population in St. Andrews, Scotland (E. S. R., 65, p. 290), dealt with a cross section of two very different working class groups in Cardiff, Wales, and Reading, England. The Cardiff study, which was made in May, June, and July, 1928, comprised 56 families with a total of 378 individuals, and the Reading in September, October, and November of the same year 57 families with a total of 370 individuals. The so-called "family man" and "diet man" values for the two groups were Cardiff 4.55 and 4.54 and Reading 4.35 and 4.30, respectively.

The Cardiff diets averaged 3,174 calories per man per day, with a distribution in grams and percentage of total calories of protein 78.7 g and 10.1 per cent, fat 113.6 g and 33.2 per cent, and carbohydrate 440.9 g and 56.7 per cent, respectively. Corresponding values for the Reading diets were 2,906 calories,

with protein 75 g and 10.5 per cent, fat 100.8 g and 32.1 per cent, and carbohydrate 408.2 g and 57.4 per cent, respectively. As in the St. Andrews study, the values for fat were definitely higher than the generally accepted averages, and with rising income the increase in intake of fat was more marked than that of protein. The Reading families, with a somewhat lower intake of total calories and all of the three groups of food constituents, were economically on a lower level than the Cardiff families. Only 53 per cent of the former and 72 per cent of the latter had incomes under £3 per week.

Data are given in full with reference to 8 Cardiff and 12 Reading families whose diets furnished 2,500 calories and under per man per day. Low income was considered only partially responsible for these abnormally low diets. Relatively high expenditures for housing and general incapacity of one or both parents are considered contributing factors. Although the number of children was too small to permit of definite conclusions concerning their physical condition in relation to diet, there appeared to be little or no evidence of real undernutrition among the children of the relatively poor families.

Dietary surveys (*Lancet [London], 1932, I, No. 21, p. 1102*).—Attention is called in this editorial to the dietary studies of Cathcart and Murray noted above and the report of Sweeny and Chatfield (E. S. R., 67, p. 184) on midday meals for preschool children. It is noted that the costs of raw materials served in the nursery school meals reported in the latter publication are very much higher than those reported by Greenwood et al. (in the paper noted below) as the actual expenditure for children's food allowed by certain public authorities in Great Britain.

Report to the Minister of Health on diets in Poor Law children's homes, M. Greenwood et al. (*London; Min. Health, Advisory Com. Nutrition, 1932*), *pp. 17*).—A brief report is given of the findings in a study of the dietaries in public institutions for children in Great Britain. In general the diets were considered to be satisfactory as far as the actual quantity of food and the supply of first-class proteins and fat were concerned. The chief faults were listed as a desire to keep cooking down to a minimum, resulting in cold breakfasts and teas; a lack of knowledge of food values; and a tendency to monotony. The milk consumption was low even for the standard of 1 pint daily. The vegetables served were thought to be adequate in both quantity and variety, but fruit was apparently considered a luxury rather than a necessity. General suggestions, supplemented with sample menus and quantity food lists, are given for improving the diet. For a home containing about 200 children the cost of a diet, as recommended, with an allowance of 1 pint of milk per child per day is estimated as about 4s. 6½d. per child per week if all provisions are bought at contract prices.

The effects of low environmental temperature upon metabolism, I, II, R. W. Swift (*Jour. Nutrition, 5 (1932), No. 3, pp. 213–225, figs. 2, 227–249, figs. 6*).—Two papers are presented.

I. *Technic and respiratory quotient.*—This paper reports basal metabolism measurements at room temperature on 21 subjects, men and women, followed by metabolism measurements after the subjects had been exposed for varying lengths of time up to 75 minutes, and in two cases 100 minutes, in a refrigerating room with a temperature varying from just below 0 to +5° C. The metabolism was measured by the open circuit method of Tissot, as modified and described by Boothby and Sandiford (E. S. R., 45, p. 670). The subjects inhaled outdoor air in all of the refrigeration periods and in most of the basal metabolism experiments.

A critical discussion is included of the significance of the respiratory quotient figures with reference to the so-called "Auspumpung," or blowing-off of more

carbon dioxide than is actually produced during the time of measurement. In one or two instances the figures for the respiratory quotient were high, indicating this effect. Aside from these, the values obtained during exposure to cold were scarcely different from those obtained under basal conditions, thus indicating no preferential oxidation of carbohydrate. With but few exceptions, the percentage of carbon dioxide in the expired air decreased in successive exposures to the cold in a perfectly regular manner.

II. *The influence of shivering, subcutaneous fat, and skin temperature on heat production.*—The data reported and discussed in this paper include the heat production per square meter per hour of the various subjects in the basal tests and three readings during the period in the refrigerator, the nitrogen elimination per hour before and during exposure to the cold, and the blood sugar before and after the exposure. Calculations are also included of the relation of the time spent in shivering to increase in metabolism and measurements of subcutaneous fat.

There was a marked increase in heat production with prolonged stay in the cold environment. This was further increased to a variable extent by shivering. The increase in metabolism considered with the time spent in shivering showed that intense shivering increased the metabolism about 400 per cent. Any increase not accompanied by definite shivering was ascribed to muscular tension.

There was no parallelism between the energy metabolism and the pulse rate or respiratory rate, but a distinct parallelism between the heat production and respiratory volume. The increase in metabolism showed no relationship to surface area, but varied in general inversely as the amount of subcutaneous fat. There was no change in protein metabolism and the blood sugar level remained unchanged, indicating that increased epinephrine secretion was not involved.

Measurements of rectal and skin temperatures showed no change in the former and a decrease in the latter. Shivering began when the skin temperature was lowered to about 19°.

High altitude metabolism studies (*Utah Sta. Bul. 235 (1932), p. 61*).—Observations on 7 college men and 11 college women are briefly noted.

Recent progress in nutrition and how it affects the dietitian, S. L. Smith (*Mod. Hosp., 39 (1932), Nos. 1, pp. 124–130; 2, pp. 112–118*).—In this review of recent literature the sequence followed is nutrition in pregnancy and lactation; problems in infant feeding, including comparisons of breast milk and cow's milk and methods of enriching both; the feeding of children, with a discussion of methods of combating anorexia and of food standards for preschool children; nutrition in adolescence and maturity, including basal metabolism standards; and a brief discussion of the important part played by the dietitian in recent developments in clinical research. A list of 51 references to the literature is appended.

Vitamin content of medicinal cod liver oils and related products, E. M. Nelson and R. Walker (*Jour. Amer. Med. Assoc., 98 (1932), No. 15, pp. 1263–1265*).—This report from the U. S. D. A. Bureau of Chemistry and Soils summarizes the results obtained over a period of about 5 years in the analysis for vitamins A and D of official samples of medicinal oils and related products collected by the Food and Drug Administration in connection with its duties in the administration of the Federal Food and Drugs Act.

In testing for vitamin A, the method followed was that of the U. S. Pharmacopeia as modified by Nelson and Jones (E. S. R., 60, p. 894) and for vitamin D the McCollum line test as modified by Steenbock and Black (E. S. R., 52, p. 862). In the latter controls were always run with a standard cod-liver oil.

The materials examined included 42 cod-liver oils, 29 tablets, 7 capsules, 28 liquid preparations, 7 concentrates, 5 emulsions, and 10 miscellaneous products.

In general the cod-liver oils examined were quite uniform in vitamin D potency, but much less uniform in vitamin A. Most of the oils low in vitamin A were distinctly rancid or off-color, or both. Nearly all of the tablets examined early in the work contained practically no vitamin A or D. For that reason in the latter part of the work only those tablets showing the presence of vitamin D were tested for vitamin A. Of the 17 brands tested, only 2 contained therapeutic quantities of vitamins A and D in the doses prescribed. Only 2 of the capsules contained both vitamins in therapeutic quantities and the others small but not significant quantities of vitamin D. It is noted, however, that more recently cod-liver oil tablets and capsules have been prepared which retain satisfactory vitamin potency for a considerable length of time. None of the liquid preparations contained either vitamin in significant quantities. All but 1 of the emulsions contained as much of both vitamins as would be expected from the formulas. The other was low in vitamin A. Four of the concentrates contained both vitamins in such quantities that they could legitimately be classed as concentrates, while 3 were practically devoid of A and contained only about one-tenth as much vitamin D as cod-liver oil.

Nutrition studies of foodstuffs used in the Porto Rican dietary.—I, The vitamin A content of white and yellow yams, J. H. Axtmayer and D. H. Cook (*American Jour. Trop. Med., 12 (1932), No. 4, pp. 317–321, figs. 2*).—As determined by the method of Sherman and Munsell, the white yam (*Dioscorea alata*) was found to contain approximately 0.25 unit per gram and the yellow yam (*D. cayennensis*) 1 unit per gram of vitamin A when fed in the peeled raw state. It is noted that although the yellow yam is four times as rich in vitamin A as the white yam, it contains only about one-fifth as much vitamin A as the yellow yautia tested by Quinn and Cook (E. S. R., 60, p. 291).

Avitaminosis.—[VII], Pathologic changes in tissues of the albino rat during early stages of vitamin A deficiency, H. S. Thatcher and B. Sure (*Arch. Path., 13 (1932), No. 5, pp. 756–765*).—This continuation of the series of papers noted previously (E. S. R., 67, p. 486) contains a brief chronological review of the literature on the pathological changes in the tissues of rats in vitamin A deficiency, and the report of a study to determine the most satisfactory criterion for the detection of the earliest stages of vitamin A deficiency. The data reported include a summary of the weight changes, changes in the posterior part of the tongue, salivary glands, respiratory tract, and urinary tract, and other pathological changes in 41 rats continued on a vitamin A-deficient diet for varying periods of from 33 to 78 days.

Metaplastic changes in the posterior part of the tongue, in the salivary glands, and in the respiratory and urinary tracts were found to be present in a large proportion of animals still making normal growth. Some of these animals showed incipient ophthalmia or persistence of the cornified stage during oestrum, and others showed no external signs of the deficiency. The respiratory troubles had reached the stage of bronchitis or pneumonia in several of the animals which were still gaining weight. "It is suggested that metaplasia of epithelial structures in the respiratory tract of man may be the precursor of the common cold, bronchitis, and broncho-pneumonia resulting from vitamin A deficiency before any other external symptoms are detected by physical diagnosis."

Early stages of vitamin A deficiency (*Jour. Amer. Med. Assoc., 98 (1932), No. 26, pp. 2290, 2291*).—In this editorial comment on the paper by Thatcher and Sure noted above, it is emphasized that the tentative hypothesis that the metaplasia of epithelial structures in the respiratory tract in the early stages of vitamin A deficiency may later be responsible for such respiratory disturbances as the common cold, bronchitis, and broncho-pneumonia "does not

warrant the exploitation of common dietary sources or concentrates of vitamins as cures of colds or influenza, but these experiments represent a step in the direction of progress in elucidating what resistance and immunity may involve."

The vitamin B complex of coconut water, J. H. Axtmayer (*Amer. Jour. Trop. Med., 12 (1932), No. 4, pp. 323–326, fig. 1*).—In this study of the relative content of vitamins B (B_1) and G (B_2) in fresh coconut water (the juice from ripe coconuts), the method followed was that of Sherman and Axtmayer (E. S. R., 58, p. 295) in which the supplementing effects of the material for autoclaved yeast as the source of vitamin G and whole wheat flour as the source of vitamin B were determined. It was found that the coconut water supplemented the whole wheat flour but not the yeast. The conclusion was consequently drawn that "coconut water taken from the ripe fruit, although a poor source of the vitamin B (B_1) factor, is a relatively good source of the vitamin G (B_2) factor."

Further evidence for the existence of a third vitamin B growth factor for the rat, probably vitamin B_4, N. Halliday (*Jour. Biol. Chem., 96 (1932), No. 2, pp. 479–486, figs. 2; abs. in Michigan Sta. Quart. Bul., 15 (1932), No. 1, p. 46*).—In this investigation at the Michigan Experiment Station the author, with the assistance of M. J. Nunn and J. D. Fisher, has obtained evidence of the presence in certain food materials of a factor (or factors) supplementing vitamins B (B_1) and G (B_2) and probably identical with Reader's vitamin B_4 (E. S. R., 65, p. 594).

The original purpose of the investigation was to determine the effect of heat on vitamin B (B_1) at varying concentrations of H ion, using skim milk powder and protein-free milk as in the similar study of vitamin G (B_2) (E. S. R., 67, p. 359). The technic of Chase and Sherman (E. S. R., 66, p. 410) was followed.

The animals which received either of the supplements in quantities sufficient to induce a gain of about 7 g a week all ceased to grow after about the fifth week. With larger portions of the supplements there was a more constant growth rate. When the diet was further supplemented with whole wheat in amounts of 0.2 g daily 6 days a week (a quantity too small to serve as an additional source of vitamin B), there was a sudden increase in growth. The possibility of this increase being due to the presence in the wheat of an additional factor was tested by Reader's technic (E. S. R., 65, p. 594). After about 3 or 4 weeks on the basal diet supplemented with either protein-free milk or skim milk and whole wheat, both supplements were removed. This was followed in about 2 weeks by a rapid decline in weight and severe polyneuritis. At this point either the original supplement or Lloyd's reagent activated with the original material was fed in amounts which had induced a gain of about 5 g a week for 5 weeks. In the animals which survived, polyneuritis was cured and loss in weight checked. After several weeks 0.2 g daily of the whole wheat was added, and this was followed by a sudden increase in the growth rate. The process could be repeated several times with the same animals.

Illustrative case reports are given and the findings discussed with reference to the literature on the subject, particularly the reports of Coward et al. (E. S. R., 62, p. 589) and of Guha (E. S. R., 67, p. 186). It is suggested in conclusion that since natural foods may or may not contain an adequate supply to supplement the animal's bodily store and whatever may be contained in the basal diet, it is advisable to supply the new factor when tests are to be made of more or less highly purified materials.

The determination of vitamin D, K. M. Key and B. G. E. Morgan (*Biochem. Jour., 26 (1932), No. 1, pp. 196–207, figs. 3*).—The results reported by Dyer (E. S. R., 67, p. 345) have been confirmed in further tests with graded doses of

vitamin D administered to two series of 10 and 6 litters, respectively, of young rats. The data were combined with those of Dyer and divided into three groups representing the litters which developed slight, moderate, and severe rickets, respectively. Curves relating the degree of healing to the dosage of vitamin D were drawn for each group and used to estimate the vitamin D potency of a sample of fish meal. The results obtained agreed closely with those obtained in a prophylactic test based on the percentage of ash in the dry fat-free bones. The curative method with the technic of Dyer is thought to be more generally useful than the prophylactic because differences in the degree of healing can be evaluated by reference to the curves. The curative technic was used in the study of the effect of changes in the ratio of Ca : P in the Steenbock rickets-producing diet. It was found that when the ratio was changed from 4 : 1 to 2 : 1 an antirachitic effect was produced equal to that given by a daily dose of 0.7 unit of vitamin D.

The vitamin D content of red palm oil, W. J. Dann (*Biochem. Jour., 26 (1932), No. 1, pp. 151–154*).—Three samples of so-called "plantation" red palm oil were found to be practically devoid of vitamin D and one sample of native oil to be low in this vitamin. This sample of oil had a much higher content of free fatty acids than the plantation oils. The author recommends the use of red palm oil of low content of free fatty acids as a convenient source of vitamin A free from vitamin D for nutrition experiments.

The mode of action of vitamin D.—The "parathyroid" theory: Clinical hyper-vitaminosis, L. J. Harris (*Lancet [London], 1932, I, No. 20, pp. 1031–1038, figs. 6*).—This concise review of the literature on the subject is based largely on the extensive investigations of the author and his associates (E. S. R., 65, p. 896) and some hitherto unpublished observations. A list of 60 references is appended.

The influence of a cereal-free diet rich in vitamin D and calcium on dental caries in children, M. Mellanby and C. L. Pattison (*Brit. Med. Jour., No. 3715 (1932), pp. 507–510*).—The initiation and spread of caries were almost eliminated in a group of children averaging 5½ years of age by subsistence for 6 months on a cereal-free diet rich in vitamin D. In comparison with earlier studies by the authors (E. S. R., 60, p. 593) and the more extensive investigation by Bennett et al., noted from a preliminary report (E. S. R., 67, p. 341), the results obtained in the present study show that diets rich in vitamin D and free from cereals are superior to those of equal richness in vitamin D but containing cereals. "The tests do not indicate that in order to prevent dental caries children must live on a cereal-free diet, but in association with the results of the other investigations on animals and children they do indicate that the amount of cereal eaten should be reduced, particularly during infancy and in the earlier years of life, and should be replaced by an increased consumption of milk, eggs, butter, potatoes, and other vegetables."

Diet and the teeth, W. E. McCulloch (*Brit. Med. Jour., No. 3731 (1932), pp. 75–77*).—This is a criticism of the investigation of Mellanby and Pattison noted above. In the opinion of the author the ill effects which they attribute to the presence of a toxamine in cereals may quite as well be attributed to the absence of certain essentials in the diet.

The extrinsic (deficiency) factor in pernicious and related anaemias, M. B. Strauss and W. B. Castle (*Lancet [London], 1932, II, No. 3, pp. 111–115*).—The theory is advanced and substantiated by clinical evidence that Addisonian pernicious anemia, the macrocytic anemia of the Tropics, sprue, and celiac disease "are due, in common, to the lack of a specific hemopoietic reaction between an extrinsic factor (vitamin B_2) and an intrinsic factor of the normal human gastric juice. In Addisonian pernicious anemia, in certain cases of sprue,

as well as in all probability in a certain proportion of all cases of the macrocytic anemia of the Tropics, the specific reaction is absent mainly because of a lack of the intrinsic factor. In those cases of sprue, of macrocytic anemia of the Tropics, and of celiac disease which respond to the administration of yeast, the specific reaction is absent mainly because of a lack of the extrinsic factor as defined above."

The possibility is suggested of preparing a simple and inexpensive product for the treatment of pernicious anemia by allowing hog's stomach mucosa (the source of the intrinsic factor) and yeast concentrates (the source of vitamin B_2) to interact under the proper condition and then drying the product. It is noted, however, that the product would probably have the heat lability of hog stomach products generally.

Attention is called to the close relationship between vitamins B (B_1) and G (B_2), and the possibility that with the former interaction with an intrinsic factor in the stomach may have a significance for the central nervous system analogous to that of vitamin B_2 for the bone marrow.

The value of some vegetables in nutritional anemia, H. Levine, F. B. Culp, and C. B. Anderson (*Jour. Nutrition, 5 (1932), No. 3, pp. 295–306, figs. 2*).—Following the same technic as in an earlier study (E. S. R., 67, p. 91) with the exception that the milk powder was fed dry instead of reconstituted and the rats were placed on the milk diet at the weight of 40 instead of 60 g, the authors have determined the curative properties for nutritional anemia of various dried vegetables fed at a constant level of iron intake. The duration of the test period was in all cases 8 weeks. The range of hemoglobin in a series of rats on the stock diet at about the same age as the experimental rats after 4 weeks was from 14 to 16.8 g per 100 c c of blood and these values were taken as normal.

In preliminary experiments with dried spinach fed ad libitum, hemoglobin regeneration to normal was effected in from 3 to 4 weeks with an average daily intake of 0.43 mg of iron and 0.0061 mg of copper. In order of decreasing content of copper and constant content of iron, 0.2 mg daily, a lettuce and tomato mixture, asparagus, lettuce, spinach, and broccoli brought about hemoglobin regeneration in from 4 to 5, 5 to 6, 6 to 7, 6 to 7, and 7 to 8 weeks, respectively. The content of iron and copper in the vegetables was determined by analysis, and it is noted that other samples might show considerable variation in absolute and relative amounts. The sample of broccoli had the lowest copper content with relation to iron, 0.002 mg for 0.2 of iron. Turnip greens fed at a level furnishing 0.425 mg of iron and 0.0179 mg of copper brought about rapid regeneration in from 3 to 4 weeks.

The more rapid regeneration on lettuce and tomato than on lettuce alone is attributed to the higher content of copper in the tomato and of iron in the lettuce, the two vegetables thus supplementing each other. "From a nutritional standpoint, therefore, a lettuce and tomato salad is to be highly recommended."

Autolyzed liver therapy in pernicious anemia, W. F. Herron and W. S. McElroy (*Science, 76 (1932), No. 1962, p. 127*).—A brief note stating that autolyzed liver has been found effective in the treatment of pernicious anemia in much smaller doses than liver. This is considered of interest in relation to recent reports concerning the influence of gastric juice and extracts of stomach on beef and liver.

Food poisoning due to toxic substances formed by strains of the cloacae-aerogenes group, R. Gilbert, M. B. Coleman, and A. B. Laviano (*Amer. Jour. Pub. Health, 22 (1932), No. 7, pp. 721–726, fig. 1*).—This is the bacteriological report on an outbreak of gastroenteritis attributed to cream-filled pastry.

The predominating organisms isolated from the feces of some of the patients and from the filling of some of the suspected cream puffs and chocolate éclairs proved to be Gram-negative, encapsulated bacilli of the cloacae-aerogenes group. The characteristics of the organisms are enumerated. It is thought that the contamination may have been introduced into the cream filling by means of the eggs. Commenting upon this, the authors state "the handling and refrigeration of 'cracked eggs' may need more careful supervision. It seems important that steps be taken to control the preparation and distribution of all cream-custard food products, as well as to disseminate information to the public to insure necessary precautions on the part of the consumer."

The iron-deficiency hypothesis in pellagra, G. A. Wheeler (*Science, 76 (1932), No. 1961, p. 101*).—A note refuting in detail, with references to the original publications of Goldberger et al., the interpretation by Bliss (E. S. R., 67, p. 92) that the work of these authors confirms his claim that pellagra is an iron deficiency disease.

Xerophthalmia: Report of a case, W. T. Davis (*Jour. Amer. Med. Assoc., 98 (1932), No. 19, pp. 1640, 1641, fig. 1*).—A detailed clinical report is given of a severe case of xerophthalmia in an elderly woman. The response to simple local treatment in conjunction with a diet rich in green vegetables and butterfat, together with viosterol, was rapid. "Under this regimen within 10 days the patient had passed from extreme suffering and weakness with poor vision to comfort and cheerfulness with good vision. The rapidity of the change was remarkable. One could trace it by the hour almost. It was certainly apparent on observation in half-day periods."

The author is of the opinion that in addition to lack of vitamin A other factors are probably involved in the tissue changes in the conjunctiva and cornea. "The thought occurs that over long periods of time, if a partial deficiency of vitamin A together with a deficiency of salts and other necessary constituents of the diet is continued, far-reaching and destructive changes may be wrought."

TEXTILES AND CLOTHING

The stapling of cottons: Laboratory methods in use at the Shirley Institute, 1931, G. G. Clegg (*Jour. Textile Inst., 23 (1932), No. 2, pp. T35–T54, pls. 12, figs. 9*).—The present contribution demonstrates the variability of cotton as a raw material and describes a method, the combined stapling test, of measuring some of the variables. Data on 70 cottons from many sources illustrate the application of the method. Possible causes of variations—genetic, physiological, and climatic, commercial practices, insects, and fungi—are discussed briefly.

A study of Empire wool production, J. E. Nichols (*Leeds: Wool Indus. Research Assoc., 1932, pp. [2]+148, pls. 25, figs. 3*).—Based extensively on a survey in 1928 to 1931 in most of the wool-producing areas of the British Empire outside of Great Britain, this report discusses sheep products, wool and the nature of the fleece, and wool classing; describes the status of the industry in New Zealand, Australia, South Africa, Southern Rhodesia, Kenya, Canada, Irish Free State, and Palestine; comments on producers' organizations, education, and research; and attempts to analyze the concept of wool improvement. A bibliography is appended.

The influence of laundering and exposure to light upon some wash silks used for outer garments, M. E. Griffith (*Ohio Sta. Bul. 506 (1932), pp. 30, figs. 4*).—This is the complete report of an investigation noted previously from preliminary reports (E. S. R., 67, p. 93). The silks studied included 7 pure dye silks costing from $1.78 to $3.68, 6 weighted silks from $1.49 to $2.72, and

2 wild silks at $1.12 and $1.14 per square yard, respectively. For the physical and chemical analyses white silks were used and for the fading tests six colors as nearly alike as possible in each type of silk. The laundering was done in a launderometer, and the fading tests were made in a fadeometer. The extent of fading was determined by matching the colors with those given by Maerz and Paul.[7]

The pure dye silks proved superior to the weighted in original strength and showed less decrease in strength on exposure to light. Less decrease in strength of both pure dye and weighted silks resulted from laundering than from exposure to light. The weighted silks showed an increase in strength after laundering, probably due to shrinkage during the laundering process.

The pure dye silks showed no superiority over the weighted as regards fading. In all samples there was very slight fading after 12 hours' exposure to light or five launderings, the fading increasing with prolonged treatment. Violet and blue faded more on exposure to light than in laundering and the other colors more in laundering.

The higher priced silks, both pure dye and weighted, had higher bursting and breaking strengths, were heavier and thicker, and (in the case of the weighted) contained less weighting and water-soluble finishing material than the lower priced samples. The pure dye branded silks showed no superiority over the corresponding unbranded silks, but the one weighted silk which was branded was superior to the unbranded weighted silks in strength, weight, thickness, and amount of weighting.

MISCELLANEOUS

Practical dictionary of agriculture, horticulture, and agrotechny, edited by C. Forti et al. (*Dizionario Pratico di Agricoltura, Giardinaggio, e Industrie Agricole. Torino: Unione Tipog.-Editrice Torinese, 1930, vol. 1, pp.* [4]+*768, pls. 35, figs. 1950; 1932, vol. 2, pp.* [3]+*1071, pls. 19, figs. 2355*).—This is a pretentious and comprehensive work, including not only definitions but encyclopedic treatment of many topics. It is copiously illustrated.

Alaska Agricultural College and School of Mines Agricultural Experiment Station, College, Alaska, 1931: Progress report, July–December, G. W. Gasser (*Alaska Col. Sta. Bul. 1 (1931), pp. 22, fig. 1*).—In addition to a brief history, experimental work reported and projected is briefly noted elsewhere in this issue.

Report of the director [of Connecticut Storrs Station], 1931, W. L. Slate (*Connecticut Storrs Sta. Bul. 176 (1932), pp. 9*).—The progress of the year is briefly reviewed.

Forty-fourth Annual Report [of Tennessee Station], 1931, C. A. Mooers et al. (*Tennessee Sta. Rpt. 1931, pp. 63*).—The experimental work reported is for the most part noted elsewhere in this issue.

Biennial Report, Utah Agricultural Experiment Station, July 1, 1930, to June 30, 1932, P. V. Cardon (*Utah Sta. Bul. 235 (1932), pp. 80, fig. 17*).—The experimental work reported is for the most part noted elsewhere in this issue.

Michigan Agricultural Experiment Station Quarterly Bulletin, [August, 1932], edited by V. R. Gardner and A. J. Patch (*Michigan Sta. Quart. Bul., 15 (1932), No. 1, pp. 54, figs. 5*).—In addition to articles abstracted elsewhere in this issue or previously, this number contains an article entitled Winter Barley Popular in Kent County, by K. K. Vining (pp. 36, 37),

[7] A dictionary of Color, A. Maerz and M. R. Paul. New York and London: McGraw-Hill Book Co., 1930, pp. VII+207, pls. 56.

NOTES

Iowa College and Station.—A building is under construction for the teaching and research in genetics at a cost of approximately $12,000.

A new cooperative project of considerable interest to the Corn Belt has been inaugurated. This has to do with investigations on the influence of the breed of hogs and the ration fed on the physical and chemical characteristics of the lard produced. Cooperating on this project are the sections or subsections of the station dealing with meats, animal production, chemistry, home economics, and agricultural economics.

Nebraska University and Station.—A new fireproof seed house and agronomic laboratory is being built at an approximate cost of $30,000. The building is 40 by 90 ft. in size and three stories high and will provide storage for the certified grain and other seed of the agronomy department, as well as a laboratory, several drying rooms, and a fumigation room.

Ohio Station.—Emma J. Collins has been appointed librarian vice Louise Hart, resigned.

Oregon College.—President W. J. Kerr has been appointed chancellor of the State institutions for higher education, which include, in addition to the college, the State university and the State normal schools.

Beatrice J. Geiger, acting head of the department of foods and nutrition, has been appointed head of the home economics department at the Iowa State Teachers College.

A system of strawberry plant certification has been put into effect by the extension service. Beginning with 1933, a minimum annual fee is to be required of each grower participating of $10 for the first acre or less and $5 for each addiional half acre or fraction thereof.

Virginia Station.—Dr. F. L. Underwood has been appointed associate agricultural economist.

Washington College and Station.—C. L. Vincent, assistant professor of horticulture and assistant in the station, has been transferred to the extension service for one year to serve as extension specialist in horticulture. During this period his previous work will be carried by J. W. C. Anderson, extension instructor in the University of Missouri.

H. A. Bendixen has received a grant from the Oberlaender Trust of the Carl Schurz Memorial Foundation, under which he will study dairy manufactures problems and travel in Scandinavian countries, Germany, and Russia for one year. During the year's leave of absence which has been granted him, Dr. N. S. Golding, associate professor of dairying in the University of British Columbia, will serve in his place as associate professor of dairy husbandry.

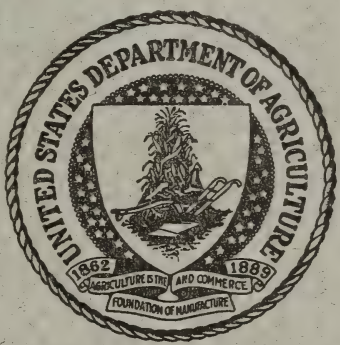
James Marshall has been appointed assistant entomologist in the substation at Wenatchee to fill the vacancy resulting from the death of Anthony Spuler (E. S. R., 67, p. 192).

Wyoming University and Station.—M. O. North has been appointed assistant professor of poultry husbandry and assistant animal husbandman vice F. J. Kohn, deceased. C. L. Corkins, research associate in entomology and apiculture, has accepted the position of State entomologist.

UNITED STATES DEPARTMENT OF AGRICULTURE
OFFICE OF EXPERIMENT STATIONS

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Editor: HOWARD LAWTON KNIGHT

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EXPERIMENT STATION RECORD

VOL. 68 MARCH, 1933 NO. 3

EDITORIAL

RESEARCH IN THE FEDERAL DEPARTMENT OF AGRICULTURE

Contrary to a widespread impression, less than 6 per cent of the total expenditures incurred under appropriations administered by the Federal Department of Agriculture during the fiscal year ended June 30, 1932, was used for its research activities. Over 69 per cent of the total of $306,400,098 was expended or obligated for road construction, 3.53 per cent was for emergency farm relief loans, 5.23 per cent took the form of payments to the States for the support of agricultural experiment stations, extension, and cooperative forestry projects, and 11.87 per cent was devoted to regulatory and other enforcement work, forest and game conservation, the weather service, and similar undertakings for the "general advantage" of the Nation as a whole. Many of the remaining expenditures, while primarily agricultural in purpose, were in effect "of as much concern to industry, to commerce, and to the general public as to agriculture." These findings are embodied in the current report of the Secretary of Agriculture as a part of an analysis which reveals anew that the Department, instead of operating for the exclusive advantage of farmers as is generally supposed, carries on most of its activities for the benefit of the general public.

The research expenditures of the Department for the year are estimated in this report at $17,718,049, with $4,357,000 additional disbursed to the States and Territories under the Hatch, Adams, Purnell, and supplementary acts and $488,814 for highway research in connection with the Federal-aid highway system. This total corresponds to about 16 cts. per capita.

Despite the relatively small proportion of the Department's funds available for scientific research, the report declares this to be the basic task of the Department. "All its other duties, such as extension and information work, eradication and control of plant and animal diseases and pests, weather and crop reporting, forest and wild-life administration, regulatory-law administration, and even road construction, rest upon research. Without research the Depart-

ment could not carry out the public functions delegated to it by Congress." Moreover, "the Department does not conduct research merely to gain knowledge that may or may not be useful. It employs research to guide action in tasks imposed upon it by Congress in response to keenly felt agricultural and national needs," and since its research projects are correlated with those of the State experiment stations and other research agencies there is little risk of duplication.

The view sometimes encountered that "agricultural research is not required at present because it tends to stimulate agricultural production" is held to be faulty logic, since "scientific methods lead to greater production at lower cost, and do not necessarily result in more acres and greater volume. . . . In farming, as in other industries, science is more necessary when prices fall than when prices rise, because the cost of production becomes more important." While agricultural research is obviously not in itself a guaranty of farm profits, since "science is only one element in farm prosperity, it is an indispensable element. . . . Farmers must hold fast to science as a means of keeping down their costs of producing commodities which markets will accept if they expect to share in the economic recovery when it comes."

The specific benefits of the agricultural research carried on by the Department are set forth in considerable detail under the headings of research that reduces production costs, research that prevents waste and widens markets, research that finds new uses, research that helps to adjust production to demand, and research that improves quality. Many examples are cited of what has been accomplished during the past year in each of these directions.

Lower production costs have been promoted in various branches of farming through such developments as earlier maturing strains of rice; better-adapted wheats, oats, and sugarcane; and disease-resistant sugar beets, cabbage, sweet corn, tobacco, alfalfa, and other crops. Improvements in haymaking methods and various farm implements, a reduction in disease and parasite hazards by advances in pest control, and the utilization of promising new insecticides are also described.

As a type of research that prevents waste, attention is called to the recent granting of a public-service patent based on experiments by the Department for the delay of rancidity development in foods by utilizing in wrappers those colors lying in the spectrum between 4,900 and 5,600 a. u., a discovery which it is thought should save millions of dollars to manufacturers and consumers. Substantial economies in transportation costs on various fruits and vegetables are in prospect through a better knowledge of cooling requirements,

while a potential saving on cotton-gin insurance by the equipment of gins with grounding systems for fire prevention developed by the Department is estimated at $300,000 annually. To the perfection by chemists in the Department and the State experiment stations of chemical washing solutions, processes, and apparatus for removing lead arsenate spray residues from apples is attributed the preservation of the extensive export apple trade when foreign countries had refused to accept American apples carrying more than 0.01 grain of arsenic trioxide per pound.

Investigations to discover new uses for farm products and by-products have been carried on by the Department for many years with notable results. Among the more recent developments have been a process for making high-grade cellulose suitable for the viscose-rayon industry from sugarcane bagasse and a method of producing high-quality starch from cull sweetpotatoes. Another discovery permits the removal of milk sugar from skim milk without affecting the casein, a process of particular value to the ice cream industry.

Quality improvement investigations by the Department, especially timely under prevailing conditions, have both economic and technical aspects. Among the more outstanding projects in this field have been the quality of meat study, in which more than 20 State experiment stations have cooperated. Improvements have also been brought about in dairy products, lettuce, cane sirup, orange juice, soybeans, and honey. Work with cotton grades has dealt with numerous economic aspects of the situation, as well as with production phases, and revealed the need of reflecting quality differences more accurately in the prices paid to growers at country points.

The foregoing illustrations, taken more or less at random from the many which are cited, bring out quite clearly the practical significance of the Department's research work and the extent to which it is of direct application to existing conditions. It represents an attempt to do for agriculture what Sir James Baillie of the University of Leeds probably had in mind in a recent paper before the British association when he said of industry: "Applied science was able to become the critic and investigator of traditional industrial processes and methods and to place the resources of a wider scientific outlook and knowledge at the service of craftsmanship." It is an important and productive function, for which in times of depression and prosperity alike there is a continuing need and a corresponding justification.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

[Investigations of the Michigan Station in bacteriology and chemistry], E. D. Devereux, R. M. Snyder, F. W. Fabian, and W. L. Mallman (*Michigan Sta. Rpt. 1931, pp. 229, 235, 236, 240–242*).—Work is noted on oxidation-reduction indicators which might serve as substitutes for methylene blue in the reductase test and on compounds of possible value as adjuvants in this test, including cysteine (which markedly shortened the reduction time) and hydroquinone; on sodium oleate used as a dispersant in the plate counting of bacteria; the bacterial decomposition of pectin in flax; analyses of 15 samples of vinegar; and bacteriological examinations of waters from various sources.

The effect of "low voltage" X-rays on the electrophoretic migration velocity, viability, and pH of Escherichia coli suspensions, K. P. Dozois, R. P. Tittsler, M. W. Lisse, and W. P. Davey (*Jour. Bact., 24 (1932), No. 2, pp. 123–132*).—In the work reported in this contribution from the Pennsylvania State College the total radiation from a Coolidge X-ray tube at 30 K. V. R. M. S. (without filters) effected no detectable changes in the electrophoretic migration velocity, viability, or pH of an aqueous suspension of *E. coli* with exposures as great as 3,000 milliampere-minutes at 15.2 cm target-culture distance. "This dose is about 100 times as great as that for which Wyckoff found a lethal effect." Possible causes for this difference are discussed; as are also the effects of "low voltage" X-rays (35 K. V. R. M. S.) upon bacteria on the basis of a theory relating stimulation, injury, and death to changes in the electrophoretic migration velocity.

The electrophoretic potential of Rhizobium meliloti, R. P. Tittsler, M. W. Lisse, and R. L. Ferguson (*Jour. Bact., 23 (1932), No. 6, pp. 481–489*).—It was shown by the authors of this contribution from the Pennsylvania Experiment Station that *R. meliloti*, like other bacteria, exhibits when suspended in distilled water a negative electrophoretic potential.

Variations as great as 100 per cent in the migration velocities of various strains were observed; and a relationship between electrophoretic potential and nitrogen-fixing ability is suggested, in that both the Northrop-Kunitz and the Falk capillary methods showed that the high nitrogen-fixing strains (with one exception, appearing in the Northrop-Kunitz method only) had a greater negative electrophoretic potential than those of lower ability. The potential was indicated by the two methods used to be approximately from 30 to 33 per cent higher in the case of the good than in that of the poorer strains, the results obtained with the Northrop-Kunitz electrophoresis method agreeing in general with those of the Falk capillary method.

Calcium chloride, in $\frac{1}{10}$ M concentration, very markedly depressed the electrophoretic migration velocity.

Liquid junction potentials.—I, Reproducible static liquid junctions constant in potential over long periods of time. II, A direct comparison of

static and flowing junctions, A. L. Ferguson, K. Van Lente, and R. Hitchens (*Jour. Amer. Chem. Soc., 54 (1932), No. 4, pp. 1279–1290, figs. 5*).—In these two contributions from the University of Michigan an improved method for making a "free diffusion" type of static junction in a 3-way stopcock, and an apparatus for the direct comparison of static, flowing, "stopped flowing," and stirred junctions are described.

Static junctions of the type 0.1 M HCl/satd. KCl or 0.01 M HCl/satd. KCl required to be made very definitely in order to be reproducible or constant. When so made they were constant for days to ±0.04 mv average deviation, and were reproducible to less than 0.1 mv. The junction between 0.1 and 0.01 M hydrochloric acid was constant and reproducible "within the limits of dependability of the silver chloride electrodes used, or within 0.02 mv." The potential of the cell system

Hg–HgCl–satd. KCl/0.01 M HCl/0.10 M HCl/satd. KCl–HgCl–Hg

"commonly called the boundary potential between 0.01 and 0.10 M hydrochloric acid," was determined to be 38.04±0.04 mv average deviation.

For concentration cells of 0.10 M and 0.01 M hydrochloric acid, the potential was found practically the same for all four types of junction. For the junctions 0.10 M HCl/satd. KCl and 0.01 M HCl/satd. KCl, the potential was in each case found to depend upon the type of junction and the rate of flow, "but these two junctions respond in opposite ways to certain treatments. The effective part of this type of flowing junction is that contained in the first three cm of the horizontal outlet tube. For the systems involving saturated potassium chloride, the potentials with static junction are less empirical than those with flowing, because the variations of the potentials of the former with time are less than the variations of the latter with rate of flow."

A new use of the vacuum tube in electrometric titrations.—I, Polarization of platinum electrodes in oxidation and reduction reactions, J. L. Kassner, R. B. Hunze, and J. N. Chatfield (*Jour. Amer. Chem. Soc., 54 (1932), No. 6, pp. 2278–2284, fig. 1*).—A positive, instead of the usual negative, potential was impressed upon the grid, and the polarization of platinum electrodes by means of a grid current was used to advantage in the electrometric titrations of some oxidation-reduction reactions.

It is considered that the different variables in this "hook-up" may be varied over a range of 20 per cent without vitiating the results. The equivalence point is indicated by the "kick" of a sensitive galvanometer and, it is claimed, "possesses the following characteristics: (a) Approach is indicated, (b) high sensitivity, (c) overstepping is immediately apparent, (d) the plotting and recording of readings is unnecessary, (e) tubes of the same type give the same equivalence point, (f) adjustments are unnecessary during titration."

The theory of the glass electrode, [I], II, M. Dole (*Jour. Amer. Chem. Soc., 53 (1931), No. 12, pp. 4260–4280, figs. 7; 54 (1932), No. 8, pp. 3095–3105, figs. 4*).—These two papers form a contribution from Northwestern University.

In the work described in the first paper the author compared the glass electrode directly with the hydrogen electrode in solutions of lithium, sodium, potassium, and barium salts at various concentrations and over the pH range 6 to 13; and critically reviews previous theories of the glass electrode, presenting a differential thermodynamic equation for the glass electrode in terms of activities and transference numbers. "A new equation for the glass electrode is discovered and shown to agree with the data up to a pH of 12. A similar equation may be theoretically derived for uniunivalent salts from the Henderson and Planck liquid junction equations if one allows the relative mobility of

the positive ions to be a function of the hydrogen-ion activity. The idea is expressed that the electric double layer at the glass aqueous solution interface determines the selective mobility of the ions across the boundary."

II. *The glass as a water electrode.*—The glass electrode was compared directly with the hydrogen electrode in acid solutions of sodium chloride and sulfate, lithium chloride, aluminum chloride and sulfate, hydrochloric acid, sulfuric acid, and in acid ethanol water mixtures. A comparison was also made over a wide pH range in a solution of sodium iodide dissolved in ethanol.

"The errors of the glass electrode in acid solutions are not a direct function of the nature or concentration of any ion present. This statement includes the hydrogen ion. The errors in alcoholic solutions are similar to the errors in acid solutions. Previous theories to explain these errors are reviewed and rejected. It is found that the acid solution errors are a function of the activity of the water; reduction of the activity of the water makes the error more negative in accordance with the equation $\Delta E = \frac{RT}{F} \ln a_{H_2O}$. Because of this the glass electrode can be shown to act as a perfect water electrode as constant pH (within the experimental uncertainties).

"The mathematical analysis of the results indicates that as the hydrogen ion migrates through the glass it carries exactly one molecule of water along with it. In other words, the hydrogen ion or proton is hydrated in the glass. The results indicate that the glass electrode when made of the glass used in this research may not be used to measure the hydrogen ion activity of nonaqueous solutions. By combining the equation for the glass electrode in acid solutions with the equation for the glass electrode in alkaline solutions given in the author's last paper, an equation for the glass electrode over an extensive pH range is obtained."

Bactericidal properties of monoethers of dihydric phenols, I–III, E. Klarmann, L. W. Gatyas, and V. A. Shternov (*Jour. Amer. Chem. Soc., 53 (1931), No. 9, pp. 3397–3407, figs. 2; 54 (1932), Nos. 1, pp. 298–305, figs. 2; 3, pp. 1204–1211, figs. 3*).—These parts deal respectively with the monoethers of resorcinol, hydroquinone, and pyrocatechol. *Bacillus typhosus* and *Staphylococcus aureus* were used as test organisms.

In parts 1 and 2 the behavior of the test organisms was similar within the species, distinctly different between the two species. Upon *B. typhosus* the effect of the ethers increased with increasing molecular weight of the aliphatic group to a maximum, reached, in the case of the resorcinol ethers, with the hexyl compound, in that of the hydroquinone ethers, with the normal amyl group. Upon *S. aureus* the effect of the resorcinol ethers did not show the attainment of a maximum with the nonyl group, and in the case of the hydroquinone ethers the bactericidal effectiveness against *S. aureus* increased with the size of the aliphatic group up to and including the octyl group, beyond which the experiments could not be carried. In general, normal aliphatic groups produced a bactericidal effectiveness greater than that conferred by secondary aliphatic groups. In the cases of both of the diphenols some aromatic group ethers showed also a marked bactericidal effectiveness.

In part 3 the following derivatives of pyrocatechol were prepared and were studied bacteriologically: Methyl (guaiacol), ethyl, *n*-propyl, *n*-butyl, *n*-amyl, *sec.*-amyl, *n*-hexyl, and *n*-heptyl ethers, and the phenyl, benzyl, phenylethyl, and phenylpropyl ethers. "All pyrocatechol monoethers studied are bactericidal agents, but of varying potency, dependent upon the molecular weight and the structure of the substituting radical. While pyrocatechol is less effective than phenol, and guaiacol (its monomethyl ether) is practically as potent, the

germicidal efficacy against *B[acillus] typhosus* increases with the increasing length of the aliphatic chain, reaching a maximum with the *n*-amyl ether and decreasing thereafter. With *Staph[ylococcus] aureus* no maximum is observed up to the *n*-heptyl ether. The *sec.*-amyl derivative is less effective in either case than the normal one. In the case of the aromatic ethers the maximum potency against both bacteria is shown by the phenylethyl ether."

Halogen derivatives of monohydroxydiphenylmethane and their antibacterial action, E. KLARMANN, L. W. GATES, and V. A. SHTERNOV (*Jour. Amer. Chem. Soc., 54 (1932), No. 8, pp. 3315–3328*).—The synthesis and bactericidal evaluation of a considerable number of compounds of the type indicated is described. Record is made of the following among other similar observations:

"While all the compounds of this series were found to be potent bactericides, some derivatives showed an extraordinarily high efficacy toward the two Gram-positive cocci studied (*Staphylococcus aureus* and *Streptococcus haemol.*). Certain regularities in the relation between the antibacterial action and the chemical composition of the compounds studied were found. Thus halogen in the para position to the hydroxyl group conditioned a greater antibacterial efficiency than halogen in ortho position. The 4'-chloro-2-hydroxydiphenylmethane was more effective than the 4'-chloro-4-hydroxydiphenylmethane against the Gram-positive cocci but less so against the two Gram-negative bacteria (*Eberthella typhi* and *E. paradysenteriae*). The monobromo derivatives of both the 2- and the 4-hydroxydiphenylmethanes were less effective than the corresponding monochloro derivatives against the germs of typhoid and paradysentery but more so against staphylococcus and streptococcus. The dihalogen derivatives were also highly bactericidal."

One or two methyl groups increased the effectiveness against the cocci, but not that against the typhoid and dysentery organisms. A methyl group with an isopropyl group lessened the effectiveness against all four of the test organisms.

Some derivatives of diiodotyrosine and thyroxine. The action of acetic anhydride on diiodotyrosine, C. S. MYERS (*Jour. Amer. Chem. Soc., 54 (1932), No. 9, pp. 3718–3725*).—The syntheses of the following are described in a contribution from the Mayo Foundation: O-methyl-, O-methyl-N-acetyl, N-acetyldiiodo-*l*-tyrosine and its methyl ester, and O-acetyl-N-acetyl-, diiodo-*l*-tyrosine, N-acetyldiiodo-*d,l*-tyrosine and its amide, azlactone and methyl, ethyl, and phenyl esters; O-acetyl-N-acetyldiiodo-*d,l*-tyrosine and its azlactone; O-methyl- and O-methyl-N-acetyl-*d,l*-thyroxine.

"The compound described in the literature as acetyldiiodotyrosine is shown to be a condensation product resulting from the action of excess acetic anhydride on diiodotyrosine and involving two molecules of acetyldiiodotyrosine." Some chemical and physical properties of this compound are described and its structure is discussed.

The hydrolysis of lignin with 12 per cent hydrochloric acid, M. PHILLIPS and M. J. GOSS (*Jour. Amer. Chem. Soc., 54 (1932), No. 8, pp. 3374–3377*).—Lignin, isolated from corncobs, oat hulls, and spruce wood by various methods, was distilled by the authors of this contribution from the U. S. D. A. Bureau of Chemistry and Soils with 12 per cent hydrochloric acid. Formaldehyde was obtained in appreciable quantity only in the distillate from one of the lignin preparations isolated from oat hulls.

The results obtained are discussed from the standpoint of the probable presence of the methylene dioxide group in the lignin molecule.

The chemical composition of oil of Ruvettus pretiosus, the "castor oil fish," W. M. COX, JR., and E. E. REED (*Jour. Amer. Chem. Soc., 54 (1932), No. 1, pp. 220–229*).—The authors of this contribution from the Johns Hopkins Uni-

versity find the oil of *R. pretiosus* to consist primarily of cetyl and oleyl esters of oleic and hydroxyoleic acids. The oil is considered best classified as a liquid wax. The constituents isolated were: Acids—stearic, oleic, gadoleic, erucic, $C_{24}H_{46}O_2$, $C_{26}H_{50}O_2$, and a hydroxyoleic acid; alcohols—oleyl, tetradecyl, cetyl, octadecyl, cholesterol, and glycerol; and the hydrocarbon, squalene. Extraction with liquid sulfur dioxide was shown to be a satisfactory method for the separation of the saturated and unsaturated constituents of the unsaponifiable fraction.

"The purgative properties of the oil have probably been overemphasized, although there does seem to be a modicum of pharmacological action. This may be dependent on its content of esters of higher alcohols."

The effect of inorganic acids on the physical properties of waterleaf rag bond paper, T. D. Jarrell, J. M. Hankins, and F. P. Veitch (*U. S. Dept. Agr., Tech. Bul. 334 (1932), pp. 16, figs. 3*).—Experiments to show the effect of small quantities of aluminum sulfate and sulfuric and hydrochloric acids on the folding endurance, bursting strength, tensile strength, and color of waterleaf all-rag bond paper artificially aged by heating for 72 hours at 100° C., were conducted by the Bureau of Chemistry and Soils, with results in part as follows:

The folding endurance, bursting strength, tensile strength, and color of the untreated paper heated for 72 hours at 100° remained the same as those for the unheated paper within the limits of error of the method of test. Small quantities of aluminum sulfate, sulfuric acid, or hydrochloric acid in paper caused rapid deterioration, the deterioration increasing as the quantities of the chemicals were increased. Hydrochloric acid caused greater and more rapid deterioration than did sulfuric acid or aluminum sulfate when the pH values of the water extract or the total titratable acidity were the same.

When the pH of the water extract from the paper treated with these chemicals was 5.1, the loss in folding endurance on heating was less than 20 per cent. By extrapolation it appeared that the loss at a pH of 5.5 would be approximately 10 per cent. A number of numerical data are given.

"The folding endurance of the paper was decidedly more affected by acidity, whether expressed as pH of the water extract or as total titratable acidity, than was the bursting strength or the tensile strength. Of the three tests employed, folding endurance yielded the most significant results as to the effect of mineral acids on this paper. It appears to be the only one of the three necessary to make in studying the deterioration of paper by acids."

Theory of the error of acid-base titration, P. S. Roller (*Jour. Amer. Chem. Soc., 54 (1932), No. 9, pp. 3485–3499, figs. 8*).—A contribution from the U. S. Bureau of Mines formulates analytically and graphically the theoretical titer error of the acid-base titration, this error being a simple function of the known error of the color indicator or e. m. f. measuring instrument, and of the concentrations and ionization constants. For the unsymmetrical titration the error was found proportional to the square root of the concentration of the product at the end-point, "so that the accuracy of the titration may be enhanced by artificially diminishing the end-point concentration."

The nature of the electrometric inflection point was examined and is discussed with reference to the symmetrical and unsymmetrical acid-base titration. "For the symmetrical titration the primary inflection point will always appear, and coincides precisely with the stoichiometric point. For the unsymmetrical titration the inflection point may not appear, and does not coincide with the stoichiometric point. The percentage titer deviation may be as high as 11 per cent, as for instance in the unsymmetrical titration of a weak acid by a strong base. . . . The absolute titration, since it is inherently four times as

sensitive as the inflection point titration, might advantageously replace the latter when the titer error is above about 1 per cent."

A comparison of methods for determining the hydrogen-ion concentration of soils, R. J. Best (*Jour. Agr. Sci. [England], 21 (1931), No. 2, pp. 337–365, figs. 6*).—The author used a simple form of the antimony oxide electrode for soil pH measurements, comparing the results with those obtained by the use of the quinhydrone and hydrogen electrodes, and giving special attention also to the limitations of the quinhydrone electrode as applied to the examination of alkaline and manganiferous soils. The nature and the control of potential drifts were also investigated.

"The adaptation lag of the quinhydrone electrode has been found to reach more serious proportions in soils than in solutions of pure mineral acids, and the antimony oxide electrode was found to be subject to the same lag. It has been definitely shown that manganese in an oxidized state is responsible for the nonapplicability of the quinhydrone electrode to some Australian basaltic soils."

Determination of aluminum. Formation of lithium aluminate, J. T. Dobbins and J. P. Sanders (*Jour. Amer. Chem. Soc., 54 (1932), No. 1, pp. 178–180*).—Place aliquot portions of the aluminum salt, sufficient to give approximately 0.1 g of lithium aluminate, in a beaker and make up the volume to 100 c c with water. To this solution add a few drops of phenolphthalein solution; then lithium chloride solution in excess of that required to precipitate the estimated quantity of aluminum in the sample. Add approximately 0.1 N dilute ammonium hydroxide drop by drop with stirring until a very faint pink color is detected. If too much ammonium hydroxide is used, add dilute hydrochloric acid until the desired pink tint is obtained. A voluminous, flocculent precipitate that filters very rapidly and washes easily is formed. Allow the precipitate 5 minutes in which to settle, filter, and wash free from chlorides with distilled water.

"An 11-cm filter paper is required for a sample giving a precipitate weighing approximately 0.1 g. After washing is complete, the filter paper with the precipitate is transferred to a crucible and placed in a low temperature oven until dry. Then the temperature is raised and the precipitate is ignited, at a high temperature, to constant weight. The precipitate is weighed and aluminum calculated from the formula $2Li_2O_2.5Al_2O_3$."

The volumetric determination of fluorine by the use of ferric chloride, J. G. Fairchild (*Jour. Wash. Acad. Sci., 20 (1930), No. 8, pp. 141–146*).—This contribution from the United States Geological Survey presents the results of a detailed study of the conditions which require to be observed in the volumetric determination of fluorine by the precipitation of ferric chloride from a standard ferric chloride solution with subsequent determination of the excess of ferric chloride by iodometric titration. Conditions suitable for the determination of quantities of fluorine within the range 0.005 to 0.06 g were established, and it is considered that this range "may probably be extended in both directions.

"Nearly perfect extraction of fluorine in phosphate rock has been accomplished by the aid of aluminum silicate, by fine grinding, and by removing calcium carbonate before adding ammonium carbonate. Phosphoric acid is removed as zinc phosphate, thus preventing the formation of insoluble ferric phosphate with the ferric chloride."

A polarimetric method for the determination of calcium gluconate, H. J. Fisher and E. M. Bailey (*Jour. Assoc. Off. Agr. Chem., 15 (1932), No. 3, pp. 461–466*).—The authors of this contribution from the Connecticut State Experi-

ment Station found that uranium salts cause a large increase in the rotation of solutions of calcium gluconate. When the solutions were saturated with uranyl acetate, the rotations at low concentrations of calcium gluconate were found to be a linear function of the concentration. A method, based on this phenomenon, was developed for the estimation of calcium gluconate alone and in mixtures, and is here given in working detail. The procedure was found to be practically specific for calcium gluconate.

A comparison of methods for determining the availability of phosphorus, H. J. SNIDER (*Jour. Amer. Soc. Agron., 24 (1932), No. 9, pp. 680–685*).—The Neubauer method (E. S. R., 50, p. 118) and the Truog direct chemical method (E. S. R., 64, p. 312) were compared by the author of this contribution from the Illinois Experiment Station with the field trial method taken as a standard. The Kewanee and Joliet experiment fields of the station (E. S. R., 68, p. 26) yielded the field trial results used.

"The results obtained by the Neubauer and Truog methods for determining the availability of phosphorus compared favorably with the wheat yields obtained on phosphate-treated plats." The percentage of phosphorus in the grain also correlated rather well with wheat yields and phosphate treatments.

"Each of the methods showed that the soils examined were deficient in available phosphorus, and indicated also the lower limits where more phosphorus should be added as well as the upper limits beyond which additional phosphorus need not be added to these soils. The three methods, except in one comparison, showed a difference between superphosphate and treble superphosphate due either to a larger amount of phosphorus added or a higher availability of the treble superphosphate. The larger amounts of rock phosphate compared favorably with the superphosphate and treble superphosphate both in wheat yield and in the Neubauer results. The Truog method showed considerably higher results with the larger amounts of rock phosphate in comparison with the superphosphate and treble superphosphate, probably due to the method of extraction."

Studies in tropical soils.—I, Identification and approximate estimation of sesquioxide components by adsorption of alizarin, F. HARDY (*Jour. Agr. Sci. [England], 21 (1931), No. 1, pp. 150–166*).—The author modified an alizarin adsorption technic proposed by L. Shmelev,[1] substituting sodium alizarin sulfonate for alizarin itself on account of the greater solubility of the sulfonated derivative in water, and adding boric acid to the alcoholic solution of the dye both to buffer and reagent and to provide the acid reaction favorable to the adsorption of the dye.

Take two samples, each 1 g, of air-dried material ground to pass a 100-mesh sieve. Heat one portion to dull redness (800° C.) for 6 minutes in a covered silica crucible. The other is not heated. Treat each portion in a Pyrex glass test tube with 20 c c of a 0.5 per cent solution of sodium alizarin sulfonate (alizarin-S) in 80 per cent alcohol, saturated with boric acid (pH 3.2). Wash down adhering particles with 10 c c of 80 per cent boric alcohol. Heat the tubes, fitted with simple condensers, in a gently boiling water bath for 10 minutes. After settling for 5 minutes, decant the supernatant liquid from each tube into a 30-c c silica Gooch crucible containing a pad of filter paper pulp, and fitted into a 1-l vacuum filtering flask. Boil the solid substance with about 25 c c of boric alcohol, pour the whole suspension into the crucible, and

[1] The method of determining the free aluminum oxide in silicate mixture and its application to the study of clays [trans. title]. Trudy Gosud. Issledov. Keram. Inst. (Trans. Ceram. Research Inst. [Moscow]), No. 14 (1928), pp. 24; Ger. abs., pp. 23, 24.

filter by suction. Wash the excess of dyestuff out of the sediment with a little boiling boric alcohol, and follow by two to ten 25-c c portions of boiling distilled water successively added until the runnings come through colorless.

Extract the adsorbed dyestuff from the stained material, for subsequent colorimetric estimation, with a molar aqueous solution of sodium oxalate containing sufficient free oxalic acid to impart a pH value of pH 3.8, using about 30 c c of the oxalate solution and boiling this in the tubes with the pads of paper pulp and the adhering stained solid material. Allow the suspension to settle for 5 minutes.

"The supernatant liquid (colored yellow by abstracted alizarin) is poured into a Buchner funnel filter (diameter 6 cm) and filtered by suction into a clean 1-l filter flask. The solid is treated with more oxalate solution, the mixture boiled, poured on to the filter, and washed with two or three 25-c c portions of boiling oxalate solution. The washings (100 to 130 c c) are finally transferred to a graduated cylinder and made up to a definite volume (140 c c) with rinsings of distilled water used for washing out the flask. The concentration of dyestuff in the final solutions is measured against a standard in a Duboscq colorimeter. The results furnish estimates both of the alumina content and of the iron oxide content of the material." In the case of ferruginous samples it was, of course, necessary to carry out a blank oxalate extraction to permit determining the correction for the yellow color of the ferric oxalate ion. A trace of a blue dye had to be added to the alizarin standard solution to permit it to be matched with the green or yellow of the ferric oxalate ion.

"The free alumina component of clays and soils appears to adsorb alizarin only after ignition, whereas the free iron oxide component adsorbs it only in the fresh, unignited state. Hence, by applying the procedure to the fresh as well as to the ignited material, an approximate estimate of both components may be accomplished in a relatively short time." The possibilities of applying the procedure in studies of soil genesis, ionic exchange processes in soils, and some soil physical properties are briefly stated.

A new method for the determination of propionic acid, J. B. McNair (*Jour. Amer. Chem. Soc., 54 (1932), No. 8, pp. 3249, 3250*).—In a brief note the author proposes the oxidation of the propionic acid to oxalates by means of alkaline permanganate; of which the solution is to be filtered from the manganese dioxide, acidified with acetic acid, and treated with calcium acetate solution; the precipitated calcium oxalate, after acidification with sulfuric acid, to be titrated with 0.04 N permanganate. Such a method was found especially valuable for the determination of propionic acid in the presence of formic and acetic acids.

The estimation of catalase in agricultural products, A. K. Balls and W. S. Hale (*Jour. Assoc. Off. Agr. Chem., 15 (1932), No. 3, pp. 483–490*).—The precautions taken by the authors, at the U. S. D. A. Bureau of Chemistry and Soils, to attain a high degree of dependability and accuracy in catalase determinations here shown are thus listed: "(1) Extraction of the raw material with glycerol-phosphate buffer, and dilution with the same solution. The extraction, as shown later, is practically complete; (2) addition to the extract of a small amount of boiled liver juice; (3) use of very dilute hydrogen peroxide for the determination, together with considerable dextrose and phosphate buffer; [and] (4) careful precooling in an ice bath, and execution of the analysis at as near 0° as possible." The hydrogen peroxide not decomposed was estimated by adding potassium iodide and titrating the liberated iodine with 0.01 N thiosulfate.

A study of the analysis of mayonnaise and the variability of its egg constituents, J. L. PERLMAN (*Jour. Assoc. Off. Agr. Chem., 15 (1932), No. 3, pp. 466–482, figs. 2*).—A study of several methods for the determination of total fat and lipoid P_2O_5 in mayonnaise, contributed from the New York State Department of Agriculture and Markets, revealed a phospholipoid decomposition "which renders a true determination of the egg yolk content rather uncertain." Alcohol-chloroform extraction yielded the highest fat and the highest lipoid P_2O_5 values in fresh samples of mayonnaise; but the tentative A. O. A. C. alcohol extraction method yielded the highest lipoid P_2O_5 values in old samples (two months and over).

"The phospholipoid decomposition in mayonnaise may occur either naturally under certain conditions, or through chance inoculation of the egg ingredients with certain enzyme-producing bacteria before the dressing is compounded. Extracellular enzyme-producing bacteria capable of effecting phospholipoid hydrolysis were isolated from decomposing egg material. It is fairly well established that the decomposition shown is due to hydrolytic action on the phospholipoids yielding free choline as an end product."

A rough approximation of the age of a salad dressing could be obtained by comparing the lipoid P_2O_5 values secured by the tentative A. O. A. C. method with those obtained by the alcohol-chloroform method.

The corrosion of the tin-plate container by food products, T. N. MORRIS and J. M. BRYAN ([*Gt. Brit.*] *Dept. Sci. and Indus. Research, Food Invest., Spec. Rpt. 40 (1931), pp. VIII+85, figs. 29*).—Following an introduction which makes a rapid general survey of the problem, the report contains chapters on previous work on corrosion, methods and objectives of the research at the Low Temperature Research Station, preliminary researches on the corrosion of iron and steel, the influence of the H-ion concentration on the corrosion of steel and tin, the influence of the H-ion concentration on the corrosion of the tin-iron couple and tin plate, inhibitors and accelerators of corrosion, corrosion and the discoloration of canned foods, and practical experiments and considerations. An appendix deals with the examination of canned fruits for factory control, and a bibliography of 73 titles is also added.

Under the subhead of remedial measures, at the end of the chapter on practical experiments and considerations, are noted the following: "(1) Careful attention to technical and mechanical details, such as efficient exhausting and perfect sealing; (2) adjustment of the acidity of the sirup in canning fruits of low acidity by the addition of 0.3 to 0.5 per cent of citric acid; (3) care in selecting sugar free from sulfur compounds which might act as accelerators of corrosion with highly acid products; [and] (4) the use of beet sugar containing an inhibitor of corrosion, or, possibly, the addition of small quantities of an inhibitor like agar-agar."

AGRICULTURAL METEOROLOGY

Soil physics in relation to meteorology, B. A. KEEN (*Quart. Jour. Roy. Met. Soc. [London], 58 (1932), No. 245, pp. 229–250, figs. 15; abs. in Nature [London], 129 (1932), No. 3256, p. 463; Sci. Abs., Sect. A—Phys., 35 (1932), No. 419, p. 1031*).—This article discusses briefly soil classification as related to types found in different climatic zones, but deals particularly with the relation of meteorology to soil temperature and moisture, the soil atmosphere, and cultivation of the soil. Results of investigations at Rothamsted on the movement and distribution of water in the soil are freely drawn upon.

The general conclusion reached is that "the properties of the soil are very closely related to its moisture, temperature, and air supply, and thus provide

direct contacts with certain branches of meteorology. The amount and distribution of moisture in the soil are the resultants of rainfall, evaporation, and percolation; the march of soil temperature is directly controlled by insolation and radiation; changes in the atmosphere affect the composition of the atmosphere in the pores of the soil. Nor is this all; moisture, temperature, and atmosphere are not independent variables; for example, changes in moisture content have important and unexpected effects on soil temperature." More specifically, it is shown that downward percolation of water appreciably reduces the loss of heat from the soil, but that movement of soil moisture is much less both in amount and extent than has previously been supposed. Evidence is offered to show that water which has reached a depth of 6 ft. in the average soil is not drawn back to the surface again by evaporation and that many cultivation operations which have been supposed to conserve subsoil water for the use of plants are not effective for this purpose.

The atmosphere and agriculture, J. Sanson (*L'Atmosphère et l'Agriculture. Paris: "Éditions Spes," 1932, pp. 146, figs. 21*).—Following a brief introduction on the development of meteorology in France, this book deals in a somewhat popular way with weather forecasting and agricultural climatology. Under the latter head are discussed the preponderance of certain meteorological factors in agriculture, the utility of climatological studies in agriculture, forecasting harvests on the basis of seasonal meteorological factors, and the climatology of France. The influence of meteorology on crop culture is illustrated in the case of wheat.

Night temperature conditions in air layers near the soil [trans. title], G. Falckenberg (*Met. Ztschr. [Braunschweig], 49 (1932), No. 10, pp. 369–371, figs. 3*).—A brief critical review of methods used and results obtained by various investigators on this subject, including some observations by the author.

Monthly Weather Review, [July-August, 1932] (*U. S. Mo. Weather Rev., 60 (1932), Nos. 7, pp. 147–162, pls. 8; 8, pp. 163–176, pls. 8*).—These numbers contain the usual summaries of climatological data, solar and aerological observations, observations on weather on the Atlantic and Pacific Oceans and on rivers and floods, and bibliographical and other information. In addition, No. 7 contains special articles on Collected Scientific Papers of William Henry Dines, B. A., F. R. S., by W. R. Gregg (pp. 147, 148) and A Contrast in Thunderstorms, by W. J. Humphreys (p. 148).

Meteorological tables, D. A. Seeley and A. E. White (*Mich. State Bd. Agr. Ann. Rpt. Sec., 70 (1931), pp. 109–120*).—Data corresponding to those previously noted (E. S. R., 66, p. 116) are reported for the year ended June 30, 1931.

SOILS—FERTILIZERS

Soils and fertilizer experiments, experiment station farm, Lexington, G. Roberts and E. J. Kinney (*Kentucky Sta. Bul. 331 (1932), pp. 215–265*).—Field plat experiments on the station farm, for the most part of the usual type, are reported in some detail with tabulations of the treatment and yield data. Following an introduction which states the general plan of the tests and discusses the use of check plats and the basis upon which crop yields were calculated, the bulletin takes up the Lexington Field, the renewed fertilizer experiments, rotation and manuring experiments, tests of fertilizers for tobacco, and miscellaneous tests in the application of fertilizers and lime, with recommendations on soil management and fertilizer practices.

[Soil and fertilizer studies in Kentucky] (*Kentucky Sta. Rpt. 1931, pt. 1, pp. 23, 24, 28, 55, 56, 58*).—This work is described under the heads of phosphorus availability; iodine in Kentucky soils, limestones, waters, and forage crops;

crop yields on outlying soil experiment fields, 1931—treatment with manure alone, and with manure, limestone, and superphosphate; soil management at the Western Kentucky Substation; and liming experiments.

[Soil and fertilizer tests in Mississippi], J. F. O'Kelly and J. C. Robert (*Mississippi Sta. Rpt. 1932, pp. 12, 13, 60, 61*).—Tests of fertilizers for corn, cotton, and pasture, and work with summer and winter cover crops are briefly noted.

[Soil investigations of the Vermont Station] (*Vermont Sta. Bul. 344 (1932), pp. 11–13*).—Data are reported on the utilization of the Addison County clay soils, problems of land utilization in 13 hill towns of Vermont, H-ion concentration and overliming of soils, movement and fixation of phosphorus in soils, and potassic and phosphatic needs of major Vermont soil types.

The relation of protein content and yield of wheat to the nitrogen content of the soil (*Idaho Sta. Bul. 192 (1932), p. 12*).—Results of the use of manure, legumes, and fallow are briefly noted.

[Soil Survey Reports, 1927 Series] (*U. S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpts.], Ser. 1927, Nos. 36, pp. 44, fig. 1, maps 2; 37, pp. 46, pls. 3, figs. 3, map 1; 38, pp. 50, pl. 1, fig. 1, map 1*).—The surveys recorded in the three reports here noted were made with the respective cooperation of the Michigan Experiment Station and the Michigan Department of Conservation, the Minnesota Experiment Station, and the Wyoming Experiment Station.

No. 36. *Soil survey of Chippewa County, Michigan*, J. O. Veatch et al.—Chippewa County, in the eastern part of the Michigan Upper Peninsula, possesses an area of 1,006,720 acres of nearly level plains, formerly glacial lake beds, gently rolling plateaus of morainic drift, and other surface features of glacial origin. Its soils are classified in 31 series containing 43 types, together with 1.6 per cent of coastal beach, rock outcrop, and made land. Rubicon sand is the most extensive single classification listed, amounting to 10.2 per cent of the total area of the county.

No. 37. *Soil survey of Mille Lacs County, Minnesota*, G. B. Bodman et al.—Mille Lacs County, in east-central Minnesota, possesses a land area of 373,120 acres, with a water area of approximately 74,880 acres, the whole lying for the most part within the region of the early Wisconsin glaciation. The lower end of the county shows some of the effects of the late Wisconsin glaciation. Rum River, running southward through the length of the county, drains, with its tributaries, the entire area.

Soils of 20 types, classified as 14 series, were found. Milaca very fine sandy loam leads in areal extent, occupying 32 per cent of the surface surveyed, and Freer silt loam occupies 11.4 per cent. Peat, unclassified, makes up 23.4 per cent of the area.

No. 38. *Soil survey of the Shoshone area, Wyoming*, T. J. Dunnewald et al.—The Shoshone area, northwest Wyoming, comprises the 567,040 acres forming the irrigated and the practically irrigable parts of central and northeast Park County and of the northern section of Big Horn County.

The soils of the area are divided into 7 series inclusive of 30 types, together with 23.6 per cent of rough broken and stony lands and 0.4 per cent of dune sand and river wash. The most extensive types are Chipeta fine sandy loam, which was found to the extent of 12.1 per cent of the entire area surveyed, and Ralston fine sandy loam, which amounted to 11.1 per cent.

Note on a method for the preparation of permanent records of soil color, C. L. Whittles (*Jour. Agr. Sci. [England], 21 (1931), No. 1, pp. 189, 190*).—Filter paper disks, marked on the under side in each case with the number of the sample, were placed in Gooch crucibles, and, after turning on the

suction pump, a suspension made from about 5 g of the soil with about 20 to 25 c c of water was dropped on to the paper a little at a time by means of a fountain pen filler until a thin film of the soil covered the paper. After drying in a steam oven the disks were removed from the crucibles and "coated with celluloid varnish by means of a camel-hair brush, care being taken that the bristles of the brush do not touch the soil film." The varnish is to be dried without heating, to avoid curling. "When dry the disk can be handled freely, as the celluloid varnish cements the soil particles firmly to the paper.

"For convenience, the disks are mounted on index cards on which the analytical data are recorded. It has been found that a small sheet of aluminum having a circular hole of the same diameter as the paper disk is of great assistance in mounting. This shield is placed on the index card and the area of the card exposed by the hole smeared with vegetable glue. The shield is removed and the appropriate disk placed in position on the card and pressed firmly into position, using blotting paper to absorb the surplus glue. The cards are finally pressed between layers of blotting paper in a screw press."

The rôle of organic matter in the classification of forest soils, M. F. Morgan and H. A. Lunt (*Jour. Amer. Soc. Agron., 24 (1932), No. 8, pp. 655–662*).—This contribution from the Connecticut State Experiment Station takes up, under the head of qualities peculiar to forest soils, the carbon-nitrogen ratio and the chemical composition of the organic matter; under that of properties of the forest soil profile influenced directly by the organic matter, the reaction and the color of such soils; under that of the vertical distribution of organic matter, the organic matter content of the various horizons of a New Hampshire and of a Connecticut podsolic soil, and of a New Hampshire and of a Connecticut crumb mull; and under the final head of total quantity of organic matter, the organic matter and nitrogen in pounds to the acre to a depth, in one group, of 24 in., and in another, of 40 in.

In connection with the last-named data "it must be borne in mind that Jenny's conclusions (E. S. R., 65, p. 20) with reference to the higher organic content of prairie soils are based chiefly upon plow-depth samples of cultivated soils. These fail to present the true picture, both with respect to total organic accumulation in the entire profile and the carbon-nitrogen ratio. The chief differences then between the organic matter of forest and prairie soils are to be found in its character and vertical distribution."

In general conclusion, it was found that the total quantity of organic matter in the forest soil profile is not greatly dissimilar to that in the much darker colored prairie soils profile. The chief differences appeared in its character and vertical distribution. In this distribution organic matter was found to have a most important and controlling influence upon the morphology of the forest soil profile.

Mull and duff as biotic equilibria, L. G. Romell (*Soil Sci., 34 (1932), No. 3, pp. 161–188*).—The earlier view of the two main types of forest humus layer as differing "in type of decomposition rather than in rate," is critically compared, in a contribution from Cornell University, with the more recent view which considers the duff formation essentially as a result of a stagnation of the decomposing processes. "An analysis of data brought together from the literature seems to show that the latter view is a result of optical and numerical illusions. The humus accumulation in duff layers has been overrated, probably mainly because so few determinations of their volume-weight or their humus content per unit volume have been made." Some such determinations from heavy duffs in the Adirondacks are reported, these agreeing well with results from Germany.

The total organic matter content of some European type profiles was computed. "It appears that typical brown forest soil frofiles with crumb mull may represent just as high a humus accumulation as podsol profiles with a heavy duff. Figures recently reported by Morgan and Lunt [see above] from this country lead to the same conclusion. An Adirondack profile with excessively heavy duff is computed, and it is shown that not even such a great accumulation necessarily implies any 'practical standstill of decomposition,' as a heavy duff formation has frequently been interpreted."

The material available on "respiration" determinations on forest soils is critically reviewed. It is shown that soil respiration determinations do not necessarily show any indication of the rate of decomposition. "Under balanced natural conditions the carbon given off as carbon dioxide (plus what is removed by leaching) will correspond to the carbon contained in the litter-fall plus the amount given off by the roots. This will apply whether the decomposition is rapid or slow. The total organic matter accumulation, on the other hand, must be in inverse measure to the decomposition rate, under balanced and otherwise comparable conditions. . . .

"A comparison of two pairs of localities with root duff and crumb mull in the Finger Lakes region of New York State has given conclusive proof of these types of humus layer being distinguished by the course which the decomposition processes take, and not by a simple difference in their rapidity. This conclusion is arrived at by determinations of nitrate level, soil respiration, and amount of organic matter down to 40 cm depth. The respiration was the same for both types; a result to be expected from the close similarity in the character of the stand. The nitrate level averaged twice as high in the crumb mull as in the root duff, but the amount of organic matter was also much higher in the crumb mull profile, meaning that the rapidity of decomposition at least can not well be higher than in the root duff. With equal soil respiration and different amounts of organic matter, it is evident that the respiration per unit weight of the latter must be different. In fact, it was twice as high in the root duff as in the crumb mull, whereas the nitrate content remained higher for the crumb mull even if referred to unit weight of organic matter. Thus, the higher nitrate level in the crumb mull can not be accounted for by a more rapid decomposition. The difference is the other way."

A comparison of two agar media for counting soil microorganisms, H. L. Jensen (*Jour. Agr. Sci. [England], 21 (1931), No. 4, pp. 832–843*).—The author of this contribution from the Rothamsted Experimental Station observed in 80 counts of soil bacteria and actinomycetes, made on mannite-asparagine agar and dextrose-casein agar, that the latter medium gave significantly higher numbers of bacteria in 76 per cent of the cases, and significantly higher numbers of actinomycetes in 60 per cent of the cases.

On mannite-asparagine agar the values of χ^2 of the bacterial counts were as a whole in agreement with expectation. The counts of actinomycetes colonies on this medium showed a tendency to subnormal variation. In 357 counts of soil bacteria and actinomycetes on dextrose-casein agar the distributions of χ^2 agreed for the most part with expectation. "The bacterial counts showed a tendency to excessive, the actinomycetes counts to subnormal variation. These abnormalities seemed most liable to occur in soils where special microfloras had been accumulated as a result of the introduction of decomposable organic matter."

The microbiology of farmyard manure decomposition in soil, I–III, H. L. Jensen (*Jour. Agr. Sci. [England], 21 (1931), No. 1, pp. 38–100, figs. 13; 22 (1932), No. 1, pp. 1–25, figs. 7*).—These three papers, opening a serial con-

tribution from the Rothamsted Experimental Station, detailed methods and results of laboratory culture experiments carried out in soils and in artificial media and present, among others, the following observations and conclusions.

I. *Changes in the microflora, and their relation to nitrification* (pp. 38–86).—A study of the microbiological processes occurring in soils with and without the addition of manures and held in jars arranged to permit access of air with a minimum of evaporation indicated, in part, that "the comparatively low fertilizing value of the organic nitrogen of the manure" may be explained on the basis of the following considerations and observations:

The organic matter of barnyard manure is a mixture of compounds of a rather wide carbon: nitrogen ratio. When this is added to the soil, the various compounds are attacked by the bacteria, actinomycetes, and fungi, and a part of the available nitrogen of the manure is used up as nitrogenous food by the microorganisms. When the supply of readily available energy material is exhausted, the bacterial numbers drop and a production of mineral nitrogen begins. This production diminishes gradually without, in any case, reaching the total amount of nitrogen in the manure. In this respect the barnyard manure resembles other organic fertilizers, which generally yield only a fraction of their nitrogen as nitrate, but here the phenomena are somewhat more complicated owing to the presence of the resistant humus fraction in the manure.

II. *Decomposition of cellulose* (pp. 81–100).—Addition of barnyard manure to laboratory soil samples gave rise in approximately neutral soils (pH 6.5 to 7) to an abundant development of cellulose-decomposing bacteria of the genus Vibrio. In faintly acid soils (pH 5.7 to 6.2) these organisms developed less abundantly, and were partly replaced by *Spirochaeta cytophaga*. At lower pH values only the fungi were active in the decomposition of cellulose. Similar results were obtained by adding filter paper or straw to soils of various reactions. Of the fungi, Trichoderma and Penicillium appeared more active in acid soil, whereas other forms, including *Mycogone nigra*, *Stachybotrys* sp., "*Coccospora agricola* (?)," and *Botryosporium* sp. seemed prominent in neutral soil.

The vibrios, of which four strains were studied in pure culture, were found very sensitive to acidity, failing to develop in the pH interval 6 to 6.4, and having an optimum at pH 7.1 to 7.6. *S. cytophaga* appeared slightly more resistant to acidity, being able to grow at pH 5.6 to 6.

"The bacteria as well as the fungi are capable of decomposing the lignified cellulose of straw. The nitrogen requirements of the cellulose-decomposing bacteria are not smaller than those of the fungi. The ratio of decomposed cellulose to assimilated nitrogen in pure cultures ranges between 25:1 and 54:1 without any clear difference between the two groups of organisms. Cellulose-decomposing bacteria do not form humus-like compounds when growing on filter paper in sand culture, but at least two of the fungi, *M. nigra* and *Stachybotrys* sp., form such compounds in sand as well as in sterile soil."

III. *Decomposition of the cells of microorganisms* (pp. 1–25).—In neutral garden soil, dried cell substance of various microorganisms—nine fungi, one actinomycetes, and two bacteria—gave rise to a more or less abundant, but always temporary, development of bacteria and actinomycetes, the last-named organisms being in many cases stimulated very markedly. The development of microorganisms was accompanied by a more or less abundant production of nitrate. After 60 days from 19 to 61 per cent of the added nitrogen had been nitrified, but after 120 days the proportion had in most cases not increased greatly. "A certain fraction of the nitrogen of microbial substance is thus

very readily nitrified, while the rest persists in the soil as an almost unnitrifiable residue. No clear influence of the carbon: nitrogen ratio of the materials was noticeable."

In sand an abundant ammonia production appeared in 10 days. After 90 days from 25 to 64 per cent of the nitrogen was left as organic residue. "Several fungus materials had left some matter of the character of α-humus: colloidal, brown to black compounds, soluble in alkali, precipitated by acid, and containing 3.6 to 8.8 per cent nitrogen and 50 to 55 per cent carbon. The mycelia containing these substances left more organic nitrogen behind than the others. Among the fungi producing them were *M. nigra* and *Stachybotrys* sp., which have been found active in cellulose decomposition in soil. The humus-like material prepared from *Polyporus* sp. proved as resistant to microbial attack as did soil humus."

The composition of soybean plants at various growth stages as related to their rate of decomposition and use as green manure, L. M. Turk (*Missouri Sta. Research Bul. 173 (1932), pp. 40, figs. 16*).—A study of the solubility of soybean plant material at different stages of maturity, as it influences decomposition rate in the soil, was made by following the rate of decomposition of the soybean plant parts as indicated in the evolution of carbon dioxide, ammonia production, nitrate accumulation, humus production, and other criteria. The work included a study of the carbon and nitrogen changes of the soybean during the growth season and of the carbon and nitrogen changes which occurred in the soil during a definite decomposition period. The more soluble or more easily decomposable constituents decreased, while the more insoluble material increased as the plants approached maturity, with a concomitant widening of the carbon-nitrogen ratio.

"In general the rate of decomposition of the plant parts was in the following decreasing order: Tops, complete plants, and roots. The water-soluble fraction was found to be largely responsible for the initial decomposition behavior. A decrease in soil nitrates occurred following the incorporation of soybean root material into the soil, which may explain the detrimental effect frequently noticed on the wheat crop following soybeans, but the top and root material greatly increased the soil nitrates. There was a distinct narrowing of the carbon-nitrogen ratio in the soil during a 30-day decomposition period. It was found that microbiological digestion and nitrogen 'tie-up' depend mainly on the energy material supplied in comparison to the amount of nitrogen."

The value of "sticky point" determinations in field studies of soil moisture, E. S. West (*Jour. Agr. Sci. [England], 21 (1931), No. 4, pp. 799–805, fig. 1*).—From numerical data presented, and from a relationship between field moisture contents and sticky points, which is graphically illustrated, the author concludes that "in comparing the moisture contents of soils in the field, material precision is to be gained if the sticky points are also determined and the comparison based on the difference between the two values. There is a high degree of correlation between the moisture contents and sticky points of soils in moisture equilibrium with each other."

An analysis of factors contributing to the determination of saturation capacity in some tropical soil types, P. E. Turner (*Jour. Agr. Sci. [England], 22 (1932), No. 1, pp. 72–91, fig. 1*).—The limitations of the "constant" saturation capacity as a factor in the characterization of types of soils, rather than individual soils, are discussed, and an attempt to overcome these limitations in the cases of three widely different tropical soil types by distinguishing between the contributions made to saturation capacity by the organic and inorganic colloidal components is described. Numerical evidence indicating that satura-

tion capacity is very closely related to the content of clay and organic matter of soil (irrespective of the proportions in which they are present), but not to the fine silt fraction, is given. "Nevertheless, the correlation between saturation capacity and (*a*) organic matter, and (*b*) clay, is significantly greater for the tropical type containing the smallest amounts of these components than for the type containing the largest amounts."

The average effect on saturation capacity of unit change in organic matter and clay was found not to differ significantly in the particular soil types examined. For the 56 soils investigated, the average increase in saturation capacity resulting from a 1 per cent increase in organic matter was $+1.508 \pm 0.375$ mg equivalent per cent; from a 1 per cent increase in clay, $+0.245 \pm 0.035$ mg equivalent per cent. For fine slit the increase was of the order of 0.05 mg equivalent per cent.

"It is shown that an estimate may be made of the equivalent weights of the organic matter, clay, and fine silt components of soil by appropriate use of regression coefficients. The values obtained for the complete series of tropical soils are organic matter 660 ± 410; clay $4{,}100 \pm 600$; fine silt, of the order of 20,000. It is shown that a close prediction of saturation capacity may be made from an expression of the type, saturation capacity $= \alpha + \beta x_1 + \gamma x_2$, where α, β, and γ are constants depending on the soil type, and x_1 and x_2 are the contents of organic matter and clay, respectively."

The capacity of the inorganic components of the soil for base exchange was found to decrease rapidly when the particles attain a diameter of 0.002 mm. "It appears that particles of greater diameter might advantageously be included in the fine silt fraction." A close relationship between the organic matter content and the clay fraction of the tropical types examined was found, this relationship being most evident in soils deficient in organic matter. "When the ratio of clay to organic matter exceeds 20, it appears that the organic matter may be present almost entirely in the form of surface films on the inorganic particles."

Reaction and calcium content of drainage water from peat deposits in New York, B. D. Wilson, E. V. Staker, and G. R. Townsend (*Jour. Amer. Soc. Agron., 24 (1932), No. 8, pp. 589–593*).—A chemical study of virgin peat soils of the cultivated areas of New York having shown the soils to be acid in reaction but relatively high in calcium (some of the soils with a pH of 5.5 or less were found to contain as much as 6 per cent of calcium oxide), the authors of this contribution from the New York Cornell Experiment Station examined the drainage waters from a number of peat deposits to ascertain the reaction and the calcium content of water that had percolated through the upper zone of peat soil acid in reaction and of high calcium content.

The reaction of the drainage waters from the principal types of peat soil under cultivation in New York was found characteristically alkaline, that of the soils characteristically acid. These values appeared to change but little during the growing season. Drainage waters found to be acid were associated with exceedingly acid soils underlain by noncalcareous material.

"There is little doubt that the reaction of the ground water is influenced by the character of the material below the peat bed. The reaction of this water, as it moves upward through the peat, seems to bear an important relationship to the reaction of the drainage water from the upper zone of the deposit. But the condition that causes the drainage water to be alkaline has not resulted in neutralizing the acidity of the corresponding soil nor has it brought about an appreciable accumulation of carbonate in the soil," as work of the station has shown (E. S. R., 67, p. 214.) "In addition to its apparent effect on the hydro-

gen-ion concentration of the drainage water, the ground water, according to its nature, appears to determine to a considerable degree the concentration of calcium in the drainage waters. If the peat deposits are relatively shallow and underlain with calcareous material the drainage water from the soils is likely to contain comparatively large quantities of calcium."

Effect of hydrogen peroxide on soil organic matter, W. McLean (*Jour. Agr. Sci. [England], 21 (1931), No. 2, pp. 251–261*).—Six per cent peroxide was found to be an unsuitable reagent for the determination of the "degree of humification" of soil organic matter, in that it was shown to oxidize not only compounds containing carbon and nitrogen but also a varying proportion of a substance containing carbon but no nitrogen, this proportion depending on the volume of reagent used and the total amount of carbon originally present in the quantity of soil employed. In the attack of peroxide on soil organic matter there appeared to be two phases, in the first of which material containing carbon and nitrogen was oxidized, whereas in the second phase the material oxidized consisted solely of nitrogen-free carbon compounds.

By the use of 3 per cent peroxide (although "2 per cent or less may be preferable for some soils") the attack on soil organic matter could be restricted to the first phase. The material thus oxidized appeared to consist of a protein complex associated with a carbohydrate complex of high carbon content. Its carbon-nitrogen ratio was found to be about 10:1. The residual organic matter surviving treatment with 3 per cent peroxide consisted of nitrogenous compounds unoxidizable even by repeated treatment with 6 per cent peroxide, and nitrogen-free compounds "possibly of a cellulose character" which could be oxidized almost completely by treatment with 6 per cent peroxide. "The carbon and nitrogen in the 'oxidizable organic matter' form about 85 and 83 per cent, respectively, of the total carbon and nitrogen in average mineral carbonate-free soils. Lower figures are obtained for carbonate soils but may be increased by repeated treatment with 3 per cent peroxide or by the use of stronger peroxide." As between similar soils of high and low fertility, it was found that the more fertile soils contained percentages of oxidizable organic matter higher than those of the less fertile.

The nature of soil organic matter as shown by the attack of hydrogen peroxide, W. McLean (*Jour. Agr. Sci. [England], 21 (1931), No. 4, pp. 595–611, figs. 2*).—Carrying further his experiments of the type above noted, the author treated a variety of soils with hydrogen peroxide of concentrations ranging from 0.25 to 12 per cent. The results, similar to those recorded in the first investigation, are, in part, stated as follows:

"Starting with the most dilute peroxide, a complex of constant composition is oxidized in increasing amount. Above a certain strength of peroxide there is no further attack on the nitrogenous compounds of the organic matter, but a progressive decomposition of nonnitrogenous carbon compounds or complexes. The fraction oxidized up to the point at which no further decomposition of nitrogenous matter occurs is termed the 'oxidizable complex,' and, whilst apparently specific for a given soil, varies somewhat in composition in different soils. The oxidizable complex accounts for 70 to 80 per cent of the total carbon and nitrogen of soil organic matter, and is more readily decomposed in carbonate-free than in carbonate soils. The carbon-nitrogen ratio of the oxidizable complex principally determines the carbon-nitrogen ratio of the soil."

The influence of hydrogen-ion concentration on the decomposition of soil organic matter by hydrogen peroxide, J. S. Hosking (*Jour. Agr. Sci. [England], 22 (1932), No. 1, pp. 92–100, figs. 2*).—The decomposition of the organic matter of the soil by means of hydrogen peroxide was shown to be a

function of the hydrogen-ion concentration of the soil, alkaline soils permitting only a very low degree of oxidation while in acid soils up to 90 per cent of the organic matter was destroyed.

The results of experiments on a considerable number of soils indicated that a portion of the organic matter is oxidized irrespective of the soil reaction. The oxidation of the remainder is a definite function of the hydrogen-ion concentration, the relation being expressed by the equation

$$\log \frac{x}{100-x} = K(\mathrm{pH} - \mathrm{pH}_1),$$

in which x represents the proportion of oxidizable organic matter destroyed at any given pH value, and pH_1 "is the reaction value of a soil where the loss on peroxide treatment is 50 per cent"; this equation having been obtained by integrating $\frac{dx}{d\mathrm{pH}} = kx\ (100-x)$, suggested by the sigmoid nature of the curve connecting the values experimentally determined. For the group of soils examined the value of K was found to be 0.673, and that of pH_1, 7.875. "The proportion of the organic matter oxidized further appears to be a definite function of the clay content of the soil. Alkaline soils containing free manganese dioxide also show small losses."

The bearing of these findings on the determination of soil organic matter and on the preliminary procedure for mechanical analysis is discussed.

The electrical conductivity of aqueous soil suspensions as a measure of soil fertility, A. Sen and C. H. Wright (*Jour. Agr. Sci.* [*England*], *21 (1931), No. 1, pp. 1–13, figs. 5*).—The results of measurements of the electrical conductivity of aqueous suspensions of stored soil samples taken at intervals of several years from four Rothamsted plats bearing the same crop every year indicated that under continuous cropping the initial conductivity (and therefore the soluble salt content) of an unmanured soil decreases steadily to a minimum value, which then remains fairly constant over a long period of years; that the 7 days' increase of both unmanured and manured soil decreases progressively (this figure, in the case of an unmanured soil for which earlier samples were available, having been found to decrease comparatively rapidly during the first few years of continuous cropping); and that the 7 days' increase of a soil manured every year is maintained throughout at a higher level than that of an adjacent unmanured soil. "There is a high positive correlation (+0.859) between tthe 7 days' increase of stored samples for various years and the crop yield for those years. But when a partial correlation is calculated, eliminating the time factor, the value is found to be insignificant (+0.061)."

Evidence indicating that, on allowing a soil in a low state of fertility due to continued cropping to run wild, or on leaving it under grass, there is a marked increase both in its initial conductivity and 7 days' increase, is also given. "This result is thus in accordance with the well-known fact that a soil left to either of the above two conditions gains in fertility."

The measurement of electrical conductivity of aqueous soil suspension and its use in soil fertility studies, A. Sen (*Jour. Agr. Sci.* [*England*], *22 (1932), No. 1, pp. 212–234, figs. 5*).—The work here noted, continuing that recorded above, involved the elaboration of a simple and rapid technic for the measurement of the electrical conductivity of soil suspensions, the procedure being adapted both to moist and to air-dry material. Considerable changes in soil conditions were found to take place on air drying, and the measurements from which the following conclusions were drawn were made on fresh soil samples.

There was practically no seasonal change in the measurements for unmanured plats giving poor yield. No appreciable reduction took place in the initial conductivity of the soil as the result of a growing crop in manured plats unless the growth was very heavy. In the latter case considerable reduction took place during only the middle period of the growth. Most of the excess salt in the soil after treatment with manure was washed down beyond the sampling depth in the course of a few months, the time required depending on rainfall.

"The 7 days' increase of soil tends to decrease slightly following the application of inorganic fertilizers, but is profoundly affected by the addition of easily decomposing organic manure such as rape cake or by the presence of dead roots and stubbles in the soil. In general these substances increase the 7 days' value, but if the soil is rich in nutrient ionic content such as nitrate, the presence of energy materials may cause a negative 7 days' increase. Continued fallowing of soil has little or no effect on the measurements. Plowing, especially when deep, affects the measurements by bringing subsoil to the surface. . . . For soil under permanent grass there are marked seasonal variations in the 7 days' increase of surface soil."

The influence of the plant upon seasonal changes in soil acidity, A. M. Smith and I. M. Robertson (*Jour. Agr. Sci. [England], 21 (1931), No. 4, pp. 822–831, figs. 4*).—Observations on a number of soils in incubation, pot, and field experiments indicated in every case that the acidity of the uncropped soil increases during the growing season to a maximum, the change in some instances amounting to more than one pH unit over the initial value, whereas plants reduced the change in acidity to such an extent that at the height of growth there was a considerable difference in acidity between the cropped and the uncropped soil. At the end of the growing season, however, the difference had practically disappeared, so that the acidity of the soil approximated that found at the beginning of the season.

Nutritional disorders in alkaline soils as caused by deficiency of carbon dioxide, J. F. Breazeale and W. T. McGeorge (*Arizona Sta. Tech. Bul. 41 (1932), pp. 113–153, figs. 5*).—From a considerable number of observations recorded, one of the principal conclusions was that, "without doubt, carbon dioxide is the most important single factor in the fertility of alkaline soils." The complete absence or great deficiency of carbon dioxide in black alkali soils appeared the greatest factor concerned with the low fertility of many of them. The beneficial effect of an application of manure to a black alkali soil was found due largely to the carbon dioxide evolved during the process of decomposition. It was indicated that plants absorb phosphates more rapidly from carbonic acid solutions than from sulphuric acid solutions.

At pH 10, which is considered a high alkalinity for a black alkali soil, neither the hydroxyl-ion concentration nor the equivalent concentration of sodium carbonate is believed sufficient to be directly toxic to plants; and, further, "the rate of transpiration of plants is not affected materially by alkaline reactions up to pH 9"; but "plants are not able to absorb phosphate or nitrate ions from solutions of greater alkalinity than that represented by approximately pH 7.6. Hydroxyl ions depress, or almost entirely prevent, the absorption of phosphate and nitrate ions by plants. The optimum pH for plant food absorption is near neutrality, or approximately pH 6.8."

Among a number of observations of a more or less physiological character was that of an absorption of phosphate by the plant more rapid in the light than in the dark; the fact that root elongation took place at an alkalinity such that the phosphate and nitrate ions were not absorbed; and that of a transpiration and ion absorption occurring independently, etc.

"In alkali soil studies, more attention should be given to the consideration of the influence of alkaline soil characteristics upon plant performance."

The availability of manganese in the soil, C. S. Piper (*Jour. Agr. Sci. [England], 21 (1931), No. 4, pp. 762–779, figs. 3*).—Laboratory tests and pot experiments on three different soil types characteristically deficient in available manganese showed that normal plant growth can be established on such soils either by increasing the acidity of the soil or by subjecting the soil to such reducing conditions as those brought about by a high degree of water saturation or temporary water-logging. "On these soils the increases in growth amounted to several hundred per cent. These responses are in every respect similar to those obtained by the application of manganese sulfate [E. S. R., 54, p. 450] to the soils. In this series manganese deficiency failure is overcome most successfully by the application of manganese sulfate or by water-logging prior to seeding."

The effect of the lack of available manganese in the soil on crop yields, T. E. Odland and F. K. Crandall (*Jour. Amer. Soc. Agron., 24 (1932), No. 8, pp. 622–626*).—A contribution from the Rhode Island Experiment Station presents the results of half-plat manganese treatment experiments (the untreated half of each plat serving as a control experiment) with spring and fall spinach, spring and fall beets, and lettuce as test crops for the five years 1927 to 1931, inclusive; and for the years 1929, 1930, and 1931, the effects, with and without manganese treatment, of treatment with hydrated lime, with magnesium carbonate, with calcium carbonate, with hydrated magnesia, and with no liming material. The test crops used in this second series of experiments were sweet corn, hay, spinach, beets, potatoes, tomatoes, and mangels.

A very large proportion of the present data agrees with that of the original and later work of the station on manganese (E. S. R., 54, p. 450; 59, p. 721) in showing very striking responses to the inclusion of manganese among the nutrients supplied. Even on the unlimed plats the yields under manganese treatment were all distinctly greater than those from the corresponding areas not treated except in the case of the potatoes, which yielded 160 bu. with, and 159 bu. without manganese. Certain questions are raised, however, on the basis of the present experiments; and it is noted that "the experiments have demonstrated that there is a considerable difference between different crops in respect to their manganese requirements."

Studies on iron, aluminum, and organic phosphates and phosphate fixation in calcareous soils, W. T. McGeorge and J. F. Breazeale (*Arizona Sta. Tech. Bul. 40 (1932), pp. 59–111, figs. 14*).—Normal phosphates of iron and aluminum were found to provide phosphate in a form readily available for plant nutrition, yielding solutions of a concentration much higher than that of the soil solution. Wheat plants absorbed phosphate very readily from solutions of the iron and aluminum phosphates. The absorption of phosphate by wheat was the greater from aluminum phosphate when equal quantities of the solid aluminum and iron phosphates were present, "because of the greater solubility of the former." The absorption of phosphate was equal when the culture solution contained concentrations of phosphate derived equally from iron or from aluminum salts.

With the exception of vivianite (mineral ferrous phosphate), the mineral phosphates of iron and aluminum were very slightly soluble either in carbon-dioxide-free or in carbon-dioxide-saturated water. Wheat plants did not absorb any phosphorus from lazulite, wavellite, or dufrenite, but absorbed it readily from vivianite when cultures were prepared with carbon-dioxide-free water. When cultures were prepared with one-fourth carbon-dioxide-saturated

water, absorption of phosphorus from vivianite was greatly increased, and slightly increased in the cases of lazulite and wavellite, but there was still no absorption from dufrenite. On varying the reaction of the culture solutions to pH 5 with hydrochloric acid and pH 9 with sodium hydroxide, there was no change in the absorption of phosphate from wavellite, but for vivianite the absorption was greatest in the plants grown in the cultures at pH 5. The mineral phosphates of iron and aluminum, with the exception of vivianite, showed very little dissociation when subjected to electrodialysis.

The mineral phosphates of calcium showed very active dissociation when subjected to electrodialysis. This dissociation was very greatly reduced when calcium carbonate was present, "which illustrates the antagonism between calcium carbonate and phosphate availability in calcareous soils."

Phosphate solubility from the various phosphate materials was found largely dependent on reaction, the calcium phosphates being very soluble at acid reactions and very insoluble at alkaline reactions, while for iron or aluminum phosphate and phytin the solubility is greatest at alkaline reactions.

Iron and aluminum phosphates reverted to very slightly soluble forms in the presence of calcium carbonate or in calcareous soils. "If sodium bicarbonate or black alkali is present, an appreciable solubility of phosphate is maintained as long as the alkalinity exists." In the presence of sodium silicate a good solubility of phosphate was maintained regardless of the presence or absence of carbon dioxide. In the presence of sodium aluminate, the solubility of phosphate was greatly reduced in the presence of free carbon dioxide, but the solubility was increased in the absence of carbon dioxide at a reaction more alkaline than that of pH 8.5.

Phosphate ions were fixed actively by iron and aluminum hydrogels in forms that did not yield to re-solution by electrodialysis. The presence of iron and aluminum hydroxides in calcareous soils was found greatly to increase their phosphate fixing power. Phosphate adsorbed by colloidal silica yielded readily to re-solution, especially by electrodialysis. A comparison of treble superphosphate and ammonium phosphate showed the latter to be the less rapidly fixed.

Organic forms of phosphate, as phytin, ground wheat grains, and lecithin, were shown readily to become available in soils.

The physico-chemical relationships of soil phosphates, T. F. BUEHRER (*Arizona Sta. Tech. Bul. 42 (1932), pp. 155–212, figs. 6*).—The principal chemical reactions contributing to the concentration of phosphate ions in the soil solution are delimited and discussed; and it is shown that, in the soils with which the present study was concerned, the phosphate which controls the equilibrium in calcareous soils is dicalcium phosphate, resulting from surface hydrolysis of carbonato-apatite.

The concentrations of intermediate phosphate ions in solutions of phosphates over a wide pH range were calculated from the step-ionization constants. "It is pointed out that $H_2PO_4^-$ ion is the ion in greatest abundance within the range of pH where phosphate absorption by the plant is optimum, and from this and other evidences $H_2PO_4^-$ must be the ion upon which the plant largely feeds. If not present in this form, the plant can make the conversion by exudation of carbon dioxide. The relation of mobility of $H_2PO_4^-$ and HPO_4^{--} ions, as estimated from conductance data, shows that these ions have very nearly equal mobilities, and that relative availability can not be judged on the criterion of mobility alone."

The equilibrium constants and corresponding free-energy changes attending the possible phosphate reactions with water, carbonic acid, and carbonates were

calculated and their applicability in predicting the reactions which will take place under a certain set of conditions pointed out. The hypothetical system: $CaHPO_4$—$CaCO_3$—H_2CO_3 is treated quantitatively in the light of solubility products and ionization constants, and an equation which shows that the equilibrium phosphate concentration is directly proportional to the H-ion concentration and inversely proportional to the calcium-ion concentration is derived. Other theoretical considerations are analyzed.

Finally, "an electrical mechanism is presented to explain the observed behavior of the root membrane in the absorption of phosphates, based upon the amphoteric character of the proteins in the membrane. The differences in behavior at the isoelectric point and on the acid and alkaline sides of this point are explained in terms of the electrical charge on the membrane, adsorption on the surface, and transmission by ion exchange from micelle to micelle."

Easily soluble phosphorus in Oklahoma soils, H. J. HARPER (*Oklahoma Sta. Bul. 205 (1932), pp. 24, figs. 4*).—More than one-half of the soils of eastern Oklahoma were found, by means of a method involving 0.2 N sulfuric acid as solvent, to contain less than 50 lbs. an acre of readily soluble phosphoric acid, so that "in many communities a profitable agricultural industry can not be developed without the liberal use of this important plant food." In the western part of the State, also, many of the soils were classified as deficient in readily soluble phosphate, although most of the last-named group of soils "were only medium deficient, while a very high percentage of the phosphorus deficiency in eastern Oklahoma was classified as low and very low in easily soluble phosphorus." Subsurface soils were found to have a phosphorus content lower than that of the surface soils.

It is noted also that in some soils a high content of organic phosphorus may affect the response secured from phosphate fertilizers applied to soils low in phosphorus soluble in dilute acid.

An appendix takes up sources of phosphate fertilizers, fertilizer manufacturers operating in Oklahoma, and fertilizer distributors, presents recommendations for fertilizer treatments of crops, and describes a procedure recommended for accurate sampling of soils for analysis.

Inspection and analysis of commercial fertilizers, spring, 1932, F. B. MUMFORD and L. D. HAIGH (*Missouri Sta. Bul. 318 (1932), pp. 8*).—This is the usual annual report of routine analyses of fertilizers (E. S. R., 65, p. 422).

Commercial fertilizers, L. S. WALKER and E. F. BOYCE (*Vermont Sta. Bul. 345 (1932), pp. 24*).—In addition to the usual analyses and purchasers' information the authors note that "every brand licensed for sale in Vermont in 1932 was in the so-called 'high analysis' class, carrying 14 per cent or more of plant food," and at the same time the average cost per ton was lower than at any time for many years. Also, the analytical figures made, as compared with the guaranties, "an excellent showing."

AGRICULTURAL BOTANY

An introduction to plant physiology, W. O. JAMES (*Oxford: Clarendon Press, 1931, pp. VIII+259, pl. 1, figs. 74*).—"This book is written for readers of senior school or junior university status, and seeks to give a balanced account of the more elementary aspects of plant physiology. . . . In compiling the experimental work set out at the end of each chapter the needs of small laboratories of limited means have been kept in mind."

Kostychev's chemical plant physiology, rev. by S. KOSTYCHEV, trans. and edited by C. J. LYON (*Philadelphia: P. Blakiston's Son & Co., 1931, pp. XV+497,*

pl. 1, figs. 45).—This book is an up-to-date rendition of a volume by the author which appeared in 1926 (E. S. R., 57, p. 415).

An indirect method of measuring the amount of foliage on different blocks of trees, R. A. TAYLOR (*Trop. Agr. [Ceylon], 73 (1929), No. 1, pp. 11, 12, pls. 3*).—It is stated that the method here described has been used successfully in estimating the effects of various manures on the foliage cover in rubber and can be used to obtain a measure of the effect produced by spraying or manuring against leaf diseases.

Certain phases of citrus leaf transpiration, E. T. BARTHOLOMEW (*Amer. Jour. Bot., 18 (1931), No. 9, pp. 765–783, figs. 3*).—Previous work related to this has been noted (E. S. R., 58, p. 250). The object of these tests was chiefly to investigate such problems as the comparative resistance of the dorsal and of the ventral side of the leaf to the loss of water, the comparative amounts of water loss from the leaves as influenced by their age and variety, and the amplitude and time (of day) of stomatal movement as indicated by the magnitude of water losses. The results as summarized are said not to confirm those of previous workers which indicated that from 40 to 50 per cent of the water transpired by the mature citrus leaves passes through the cutinized dorsal epidermis in which there are no stomata, and that the stomata on the mature leaves do not function but become permanently closed.

The influence of light and temperature upon the utilization by young seedlings of organic reserves in the seed, H. L. SHIRLEY (*Amer. Jour. Bot., 18 (1931), No. 9, pp. 717–727, figs. 3*).—This work was intended to establish fundamentally important facts chiefly for application in the management of forest tree seedlings, particularly conifers, by making use of herbaceous seedlings assumed to be in principle like the conifers as regards the early utilizations and dependencies. Maize seedlings were grown in light or in darkness to determine if the light, aside from its photosynthetic effect, had any influence on the rate of utilization of the stored foods in the grain and the resultant growth of the seedlings.

With temperature conditions under control, no difference appeared between the weights of residual seeds whether the seedling grew in light or in darkness.

During the first four or five days after germination seedlings in the darkness increased in dry weight as rapidly as did seedlings in the light. After that time those in the light accumulated dry matter much faster, but this change is thought to be due to photosynthetic activity in the light.

An increase in temperature from 21.7 to 23° C. caused a 10 per cent increase in the dry weight of maize seedlings in spite of the fact that the plants at the lower temperature were in the light and the others in darkness.

The effect of light on germination and initial growth through its association with increase of soil temperatures is believed to be of considerable ecological importance in determining seedling establishment, especially in forested regions of northern latitudes.

The process of accumulation of oil and other principal nutritious substances in the grain of flax for fiber and for seeds [trans. title], M. P. ARKHANGEL'SKIĬ (ARHANGELSKY) and V. N. SUCHKINA (SOUCHKINA) (*Trudy Prikl. Bot., Genet. i Selek. (Bul. Appl. Bot., Genet. and Plant-Breeding), 25 (1931), No. 1, pp. 199–222, figs. 3; Eng. abs., pp. 220–222*).—The authors carried out investigations regarding the rates of variation in the fat, crude protein, cellulose, ash, and other constituents in flaxseeds, using for this purpose both seeds of flax for fiber and seeds of flax for oil in different stages of maturity in the year 1925, during which the climatic conditions are said to have approached the averages for many years. These are detailed with discussion.

The origin, development, and increase of chloroplasts in the potato, W. E. Stone (*Jour. Agr. Research [U. S.], 45 (1932), No. 7, pp. 421–435, pls. 10, figs. 6*).—In a contribution from the Vermont Experiment Station the author describes the formation and division of healthy chloroplasts in the potato, as a representative of the Solanaceae, as a basis for studying the abnormal chloroplasts shown in plants affected with virus diseases.

Observations, measurements of cells, and plastid counts are said to indicate the number of plastids per cell as fairly constant and plastid division as not independent of cell development but as merely one stage of the process. Although plastid divisions were found abundant in material fixed at all hours of the day and night, they were somewhat more plentiful in the material fixed during the night hours, when the plastids were losing the material temporarily stored during the hours of sunlight.

Attempts to grow plastids from primordia outside the plant in expressed filtered leaf juice failed, due either to the plastids not developing from primordia minute enough to pass through a Jenkins filter, because of the toxicity of the potato juice, or because the normal growing conditions in the cell were absent. A search for chondriosomes or plastid primordia in embryonic leaves revealed no bodies of this type. In embryonic leaves of the potato, plastids were found to originate from the cytoplasm directly. By gradual vacuolation the cytoplasm was separated into dense masses which rounded off, became compact, and developed into mature, independent chloroplasts. Differentiation of chloroplasts from homogeneous cytoplasm did not occur simultaneously throughout all portions of the leaf. Isolated regions appeared first in the spongy tissue and later in the palisade tissue. Differentiation was completed first in the spongy tissue. Plastids were found to be in different stages of differentiation in various regions of a single cell.

The plastids were found to increase in number through the division of the original chloroplasts as the cell grows, but the increase was slower than the rate of cell growth. Division of the chloroplasts is said to be a process of elongation and pinching, the connections between the new plastids persisting for some time. The arrangement of the plastids in pairs was found very striking even after all visible connections had disappeared. In general, all dividing plastids in a certain region were approximately in the same stage of division. Plastid division is considered to be a phenomenon connected with the growth and maturation of the cell.

Investigations upon the ineffectiveness of root-nodules on Leguminosae, M. P. Löhnis (*Zentbl. Bakt. [etc.], 2. Abt., 80 (1930), No. 15–22, pp. 342–368, pls. 3, figs. 8*).—Ineffectiveness in nodule bacteria may be due to different properties. The "brown bacteroids" said to have been described by Frank are regularly present in pea plant nodules grown on a sterilized medium. Plants containing sufficient nitrogen are immune to further infection by *Bacillus radicicola*. Ineffectiveness in nonworking pea strains is not due primarily to the production of a large number of nodules.

Studies on the growth of root hairs in solutions.—VIII, Structural and intracellular features of collards in calcium nitrate, C. H. Farr (*Bul. Torrey Bot. Club, 55 (1928), No. 9, pp. 529–553, figs. 3*).—There was presented in paper VI of the series previously noted (E. S. R., 61, p. 626) an account of studies on certain structural responses of roots and root hairs of Georgia collards to various H-ion concentrations and molar concentrations of calcium hydroxide. The present paper outlines a similar study of the same plant in calcium nitrate.

Studies on the growth of root hairs in solution.—IX, The pH-molar rate relation for collards in calcium nitrate, C. H. Farr (*Ann. Missouri Bot.*

Gard., 16 (1929), No. 1, pp. 53–81, figs. 10).—The present article of this series (see above) describes the improvements made in the methods previously used, with curves and graphs obtained in the present examination. It is believed that the method presents an accurate method of study regarding the specific effects of different substances upon the simple process of cell enlargement.

Some studies of root habits of sugar cane in Cuba, J. H. Jensen (*Trop. Plant Research Found. [Yonkers, N. Y.] Sci. Contrib. 21 (1931), pp. 37, figs. 14).*—The root development and root distribution of nine varieties of sugarcane were studied mainly on two soil types in Cuba, one of these being a friable, deep, well-drained clay and the other a heavy, plastic clay, sticky when wet and having an impervious subsoil. One-bud seed pieces were used for uniformity, and the studies were carried out when the plants were 4, 6, and 10-11 months old. Descriptions and drawings indicate the development as well as the distribution of the roots.

Some studies were made also on soil containing rocks, on badly cracking soil, and on soil having a high water table.

The rôle of phosphorus in the metabolism of plants, E. A. Cockefair (*Amer. Jour. Bot., 18 (1931), No. 7, pp. 582–597).*—"The present study is chiefly concerned in the relation of phosphorus to the release of energy." The greatest concentration for total phosphorus in plants appears to be in the region of greatest metabolic activity, though phosphorus content in plants is relative and subject to environmental and hereditary factors.

True comparative total phosphorus content in tissues calculated on a dry-matter basis must take into account the relative amounts of nonmetabolically active tissue indicated. Carbohydrate phosphate esters supposedly serve the same purpose in the higher green plants as they do in muscular contraction and in yeast fermentation.

The toxic action of magnesia on sugar-cane, M. Bird (*Agr. Jour. Brit. Guiana, 3 (1930), No. 3, pp. 176–178).*—Studies briefly outlined are believed to show that the presence in excessive proportions of magnesia compounds as compared with the lime content is the condition responsible for the occurrence of toxic action on sugarcane and for the occurrence of wilting and ultimately of death of the canes in the field.

"There seems to be, however, little connection between depth and quantity of magnesia, this latter probably varying with the fluctuations of the currents of water which, in past geologic periods, brought the magnesium silicate (for it was originally evidently in this form) from the interior of the continent and deposited it in its present position."

Effect of some inorganic and organic mercurials on growth of Lupinus albus, D. I. Macht (*Amer. Jour. Bot., 18 (1931), No. 7, pp. 598–602).*—In this work, thought to be of value not only from the scientific point of view but also practically for the detection of inorganic mercurial adulterants added to solutions of pure organic mercury compounds, a number of inorganic and organic mercurial compounds in solution were studied in connection with the growth of seedlings of *L. albus*. A marked difference in toxicity was noted between the inorganic mercury and most of the organic mercury compounds studied. The toxicity of various concentrations of oxydibromofluorescein at 19 and 25° C., respectively, was studied on a more elaborate scale. A method has been developed of detecting the presence of inorganic mercurial impurities or adulterants added to solutions of oxymercuridibromofluorescein or mercurochrome.

The effect of ultra-violet radiation upon higher plants, E. T. Eltinge (*Ann. Missouri Bot. Gard., 15 (1928), No. 2, pp. 169–240, pls. 13, figs. 2).*—The effects of raying on lower organisms are outlined. Raying selected plants with

an unscreened quartz mercury vapor lamp injured all the plants used, while raying with a lamp screened with Vitaglass benefited some and caused no change in others. Anatomical lesions were not visible, but slight retardation was evident in others. Raying through Quartz-lite glass benefited some plants, injuring none, but in some cases Vitaglass gave more benefit. Except for *Raphanus* sp. and possibly *Lactuca* sp., the healthiest looking plants were those rayed with a screened lamp. The effects of distance from light and from screen varied. Flower production was slightly increased by raying with a screened lamp. The effects on leaf thickness and on stems are detailed. A limitation of the amount of available food emphasizes the injurious influence of ultra-violet rays, which had little or no effect on chlorophyll decomposition and thus very little on the photosynthetic apparatus. Ultra-violet radiation had no effect on the pH of the plants used.

Relation of nutrients to perithecial production under ultra-violet irradiation, F. L. Stevens (*Philippine Agr., 19 (1930), No. 5, pp. 265–272, figs. 3*).—In 1928, a preliminary account was given by the author (E. S. R., 59, p. 519) of the sexogenetic effect of ultra-violet irradiation upon *Glomerella cingulata*. The present account records the results in detail of experiments made to ascertain whether or not the sexogenetic response to irradiation may be altered, increased, or decreased by the application of nutrient or other substances to the media upon which the fungus was grown. For this purpose three strains, among others, of *G. cingulata* of the following characters were used: G 9–2 which produced perithecia whether irradiated or not, G 10–15 which produced perithecia only when irradiated, and G 2–12 which has never been known to produce perithecia. These were tested by the addition of various chemicals to determine the relation between the nutrients provided and the perithecial response due to irradiation. The results with some discussion are detailed. Such poisons as mercuric chloride, nitric acid, phenol, potassium hydroxide, calcium chloride, and formalin when similarly tested repelled and distorted mycelium, but no perithecia resulted.

Further observations regarding ultra-violet irradiation and perithecial development, F. L. Stevens (*Philippine Agr., 19 (1931), No. 8, pp. 491–499, figs. 6*).—Though the story of the development of a perithecium without irradiation is difficult to follow on account of the uncertainty as to its occurrence, yet with suitable strains, as G 10–15, about 15 perithecia per square millimeter of agar plate can be obtained in a few hours, so that more satisfactory progress can be made. This possibility was utilized, and the present account records the resulting study, with observations and inferences.

"In my own researches it is observed that a very common, though not universal, effect of irradiation is to increase sexual or asexual production if such occurs normally and in some species to induce the sexual stage where it does not occur normally.

"On irradiation certain cells only or certain groups of cells respond. It is roughly estimated that even less than one cell in 500 so responds. Also it appears that cells in certain zone ages respond in some strains, though not the same zone ages respond in other strains. The fact that groups of perithecia form in response to irradiation in a zone of certain age but that such groups are not produced throughout this zone shows that there are individual cell differences not due to age alone that render perithecial response by them to irradiation possible. A second crop of perithecia often appeared near by those first induced; this may be due to a lag in the original direct stimulation or it may be due to a secondary effect arising from the adjacent group of perithecia. If so this may indicate a transfer of stimulus from cells that responded to irradiation to cells that did not so respond."

The effects of ultra-violet irradiation on various Ascomycetes, Sphaeropsidales, and Hyphomycetes, F. L. Stevens (*Zentbl. Bakt. [etc.], 2. Abt., 82 (1930), No. 8–14, pp. 161–174, figs. 17*).—Sufficiently severe dosage with ultra-violet irradiation produced a stunting or even a fatal effect upon a fungus. Lesser dosage inhibited measurably the development of superficial structures. Of the numerous fungi imperfecti tested none gave perithecia after irradiation except species of Gloeosporium and Colletotrichum. Some species of pycnidial or of perithecial fungi normally forming these sporing organs gave them in much larger numbers after irradiation using moderate dosage.

Behavior of zoospores of Synchytrium endobioticum [trans. title], E. Köhler (*Zentbl. Bakt. [etc.], 2. Abt., 82 (1930), No. 1–7, pp. 1–10, figs. 3*).—After describing a simple method of obtaining a suspension of zoospores from the summer sporangia, the author details an account of his observations as to the behaviors which were studied.

Failure of hazelnut [trans. title], A. Romeo (*Ann. R. Ist. Super. Agr. Portici, 3. ser., 4 (1931), pp. 221–225*).—It is stated that besides the physiological failure of young hazelnuts, forms of traumatic failure are to be reckoned with. These may be due to the perforating and sucking activity of bugs in the stage previous to the formation of the seeds and again in a stage after the seeds are practically or completely developed.

GENETICS

Paradoxical terminology in genetics, F. B. Hutt (*Amer. Nat., 66 (1932), No. 704, pp. 274–277.*)—A discussion of the use of the word "recombination" in genetic literature.

The time of action of genes, and its bearing on some evolutionary problems, J. B. S. Haldane (*Amer. Nat., 66 (1932), No. 702, pp. 5–24*).—Examples are cited to show the extreme variations in the time of the expression of genes ranging in the life cycle from the unfertilized egg to the size of seed, due to genes carried by the parent. The time of action is thus distributed over more than one generation. Variation in the time of action of genes is considered an important factor in evolution.

The rôle of genetics in etiological pathology, G. K. K. Link (*Quart. Rev. Biol., 7 (1932), No. 2, pp. 127–171, figs. 3*).—"The first part of the discussion is devoted to an analysis of the present status of pathology, especially plant pathology, so far as etiological concepts and propositions are concerned; the second, to an analysis of the fundamental concepts, propositions, and definitions of pathology; and the third, to a fusion of the concepts and propositions of pathology and of genetics, with a brief statement of the historical background of the separation which exists at present." A bibliography includes 199 titles.

Chromosomal configurations of Oenothera species and crosses and their probable significance, J. T. Illick (*Bot. Gaz., 94 (1932), No. 1, pp. 1–50*).—This paper tabulates all chromosomal configurations of the Oenothera species and crosses so far observed, and discusses the significance of chromosomal cohesion. The tables of each form include the name of the investigator, the year reported, and, where available, the source of material and the genetic constitution of each.

Natural crossing in oats at Morgantown, West Virginia, M. M. Hoover and M. H. Snyder (*Jour. Amer. Soc. Agron., 24 (1932), No. 10, pp. 784–786*).—Further studies (E. S. R., 57, p. 29) at the West Virginia Experiment Station indicated that the extent of natural crossing in Fulghum oats (*Avena byzan-*

tina) depends somewhat on the position of the floret in the spikelet. Far more natural hybrids were found among the plants coming from secondary seeds of Fulghum grown adjacent to a black-seeded variety than from primary or tertiary seeds.

Notes on the inheritance of grain colour in certain oat hybrids, W. Robb (*Jour. Genctics, 26 (1932), No. 2, pp. 231–238*).—The segregations for grain color in 25 crosses between nonwhite and white-grained cultivated varieties of oats were determined at the Scottish Plant Breeding Station. The ratios obtained indicated that the Bell, Black Mogul, Black Tartarian, and Sir Douglas Haig varieties are homozygous for the factor *B* for black-grain color and may be represented factorially as *BB*. Myrtle and Black Mesdag oats are homozygous for a factor *G*, for gray-grain color where *B* is epistatic to *G*, and may be represented factorially as *BBGG*. Orion oats, *BBB' B' GG*, are homozygous for *B* and *B'*, which are both epistatic to *G*. Eleven white-kerneled varieties studied are homozygous recessives for these factors, i. e., *bbb' b' gg*. While there is no numerical difference, there seems to be a qualitative difference in the factors controlling grain color in Myrtle and Black Mesdag oats.

Segregations in red clover (Trifolium pratense L.), H. Wexelsen (*Hereditas, 16 (1932), No. 1–2, pp. 219–240, figs. 6*).—Inheritance studies with plants largely selected from Molstad, a Norwegian strain of late red clover, showed that the presence of central leaf spot depends upon one dominant factor. Of three sizes of leaf spot described, large is a simple dominant to small, and extended is a modified large. The intensity of leaf spot is affected by at least two factors. Dark, medium, and pale green leaf colors are dominant in the order given and each differs apparently by one factor. The plants recessive for the color gene, *cc*, have green vegetative parts and white flowers and seed, but do not form red color. Red color on stems and stipules, very sensitive to environmental conditions, is governed by two dominant factors. Special restriction factors may produce green stipules and red stems, and vice versa. White flower color may be due to *cc* or to a recessive w_1, apparently not a basic color gene. The factors wp_1 and wp_2 were found to produce white flowers with a trace of pink on the tube, and wp_3 white flowers with a little pink at the tips. However, crosses between these types gave normal red flowers. Inbred families and their F_1 crosses differed widely in resistance to mildew (*Erysiphe communis*). Resistance seemed to be a character relatively simple in inheritance. Aberrant types arising in the inbred material included several kinds of chlorophyll-deficient seedlings; "minute," having very small leaves in the upper part of the plant and small branched flowerheads; dwarfs; and stemless and triple-head plants.

A cumulative transgressive segregation in wheat, G. Stewart and C. L. Dalley (*Jour. Amer. Soc. Agron., 24 (1932), No. 10, pp. 755–764, fig. 1*).—Utac wheat, a pure-breeding segregate from Sevier × Dicklow, with denser spikes than either parent, fully awned and white kernels, was crossed at the Utah Experiment Station with Ridit, which has lax spikes, short apical awns, and red kernels. The three spike-density groups in the F_2 progenies, homozygous dense, heterozygous, and homozygous lax, were explained on a 1-factor basis. Homozygous and heterozygous groups were separated readily by using the coefficient of variability. The spikes of homozygous dense progenies were more compact than those of Utac, and the lax progenies were more lax than Ridit. These transgressive segregations, when studied statistically, were found to be definite and pronounced. A 1-factor difference was indicated for awns, and a 2-factor difference for grain color.

[Studies in animal genetics at the Idaho Station] (*Idaho Sta. Bul. 192 (1932), p. 22*).—Brief accounts are given of studies on the inheritance of

"blind" teats in swine and white spotting and whorls in the hair of Duroc-Jerseys. Studies were also made of the behavior and secondary sex characteristics of cryptorchid swine.

Green's studies of linkage in size inheritance, W. E. CASTLE (*Amer. Nat., 66 (1932), No. 702, pp. 82–87*).—It is pointed out that the linkage between size and certain color genes in mice, as suggested by Green (E. S. R., 67, p. 231), is probably due to the tendency of genes located in different chromosomes to segregate more often than would be expected by random distribution, similar to cases previously cited in rabbits and fowls.

Genetic linkage in size inheritance, C. V. GREEN (*Amer. Nat., 66 (1932), No. 702, pp. 87–91*).—In answer to the above comments of Castle, the author reaffirms his belief that his data are indicative of linkage relationship between size and color factors.

An inherited udder abnormality in cattle, E. E. HEIZER (*Jour. Heredity, 23 (1932), No. 3, pp. 111–114, figs. 3*).—The appearance is noted of several related cows in the Guernsey breed which had only three teats. This condition appeared to be inherited as a recessive character.

Inheritance of hernia, T. R. WARREN and F. W. ATKESON (*Jour. Heredity, 22 (1931), No. 11, pp. 345–352, figs. 3*).—Data are presented on the occurrence of hernia in male animals of three Holstein herds, all of which traced back to the same sire. It appeared that the characteristic was inherited in a simple manner, dominant to the normal. Only one herniated heifer was noted, suggesting that it is not ordinarily expressed in females. The character did not appear to be sex-linked from the analyses of several different matings.

The inheritance of blood groups in swine [trans. title], A. KAEMPFFER (*Ztschr. Induktive Abstam. u. Vererbungslehre, 61 (1932), No. 2, pp. 261–300, fig. 1*).—A study of the blood characteristics of 162 sows and boars and 511 pigs indicates that there are three blood groups in swine. One is due to a dominant factor A, which is also epistatic to α, a serum factor. The genes for antibodies and serum properties were multiple allelomorphic. There was no relation between sex and the expression of the blood groups.

An inbreeding experiment with Poland China swine, H. C. MCPHEE, E. Z. RUSSEL, and J. ZELLER (*Jour. Heredity, 22 (1931), No. 12, pp. 393–403, figs. 2*).—An account is given of the results of inbreeding experiments with Poland China swine in the U. S. D. A. Bureau of Animal Industry, in which brother and sister matings failed in the second generation, owing largely to a decrease in fertility and a high mortality. The average size of litters dropped from 7.15±0.19 in the controls to 4.26±0.48 in the second-generation inbreds. The percentage dead at birth increased from 3.03 to 9.37, and the percentage raised to 70 days decreased from 58.1 to 26.6 in the controls and second-generation inbreds, respectively. On the average about twice as many services were required as there were litters produced by the inbreds. The birth weights of the controls averaged 2.75±0.02 lb. as compared with 2.29±0.04 lb. for the inbreds. The 70-day weights for the corresponding groups were 34.7±0.32 and 28.9±1 lb. The sex ratio of inbreds was very high, 156 males per 100 females in the second generation, which further complicated the situation as regards continuing the study by brother and sister matings. A higher prenatal mortality was suggested as the cause for the reduced litter size and a differential susceptibility of the sexes as the cause for the modified sex ratio. A segregation of recessive genes was suggested by the appearance of peculiar color and other characters such as sepia color, banding of the bristles, cleft palate, scrotal hernia, and ridgelings.

The inheritance of fertility in stallions [trans. title], D. Kisslowsky (*Züchtungskunde, 7 (1932), No. 2, pp. 58–62*).—The correlation of 0.337±0.097 between the percentage of fertile matings of 83 East Friesian stallions and their sires is taken to indicate that fertility of the stallion is hereditary.

The sex-linked method in poultry breeding, R. C. Punnett ([*Gt. Brit.*] *Min. Agr. and Fisheries Bul. 38 (1931), pp. III+10, pls. 2*).—This is a revision of Miscellaneous Publication No. 55 (E. S. R., 58, p. 29), including reference to the development of a breed of fowl at Cambridge called Cambar for which the sex may be identified at hatching.

Linkage of genes for crest and frizzle, A. D. Suttle and G. R. Sipe (*Jour. Heredity, 23 (1932), No. 3, pp. 135–142, figs. 5*).—In a study of the inheritance of the crest and frizzle characters in fowls, it was found that both were due to single dominant Mendelian characters. In reciprocal matings between heterozygous frizzle crested birds and normals it was shown that the genes for these characters were linked with about 28 per cent of crossing over in both sexes. The gene for frizzle reduced the size of the frizzle birds from 25 to 50 per cent, and the homozygous individuals were smaller than heterozygous birds.

Early and late feathering in Rhode Island Reds, F. A. Hays (*Amer. Nat., 66 (1932), No. 704, pp. 286, 287*).—A classification according to the rate of feathering at 12 days of age of Rhode Island Red chicks of the Massachusetts Experiment Station flock, bred for fecundity, showed there were about twice as many females as males in the early-feathered groups, substantiating the hypothesis that early feathering is due to a sex-linked recessive gene.

Physiological factors necessary to alleviate genetic lethal anemia in mice, J. W. Gowen and E. H. Gay (*Amer. Nat., 66 (1932), No. 705, pp. 289–300, figs. 2*).—An account is given of the prolongation of the life of homozygous dominant mice, which are anemic, by the injection of small amounts of blood from normal animals. Such treated animals, however, did not reproduce although an attempt was made to breed them.

A new yellow Peromyscus, R. R. Huestis and E. Barto (*Science, 76 (1932), No. 1968, pp. 255, 256*).—The discovery of a dilute yellow mutation in Peromyscus is noted. This appeared to be due to a simple recessive factor. The eyes of the mutant were less protruding than in the wild type. They were also more sensitive to light and appeared to be slightly reddish. The growth rate of the mutants was normal.

Hereditary variations in the skull of the rabbit, H. S. N. Greene and W. H. Brown (*Science, 76 (1932), No. 1975, pp. 421, 422*).—Studies of the inheritance of skull variations in the rabbit indicate that those conditions described as "reversed suture," "accessory bone," and "fused suture" are controlled by specific characters which are recessive to the normal. They are also differentiated into right and left sided characters. There is uncertainty regarding the combination of genetic factors producing the ridge, dome, and related forms of skull. Profound variations in the form of the skull can be transmitted, unaltered, from parent to offspring, and they are inherited as distinct entities.

Hereditary variation of the chinchilla rabbit, P. B. Sawin (*Jour. Heredity, 23 (1932), No. 1, pp. 39–46, figs. 5*).—This paper describes the genetic color and eye variations which have been observed in the chinchilla rabbit. The six allelomorphs in the chinchilla series in their order of dominance are as follows: Full color (*C*), dark chinchilla (ch^3), light chinchilla (ch^2), pale chinchilla (ch^1), Himalayan albinism (c^H), and true albinism (*c*). Dominance of the chinchilla genes was incomplete. The different chinchilla factors have specific effects on eye color. Dark chinchilla produces a blue eye color, but ch^3ch^2 or

$ch^s ch^1$ individuals have the desired brown eye color. Modifying factors also act on blue-eyed $ch^s ch^s$ individuals to produce some dark-eyed offspring.

Growth rates and racial size in rabbits and birds, W. E. CASTLE (*Science, 76 (1932), No. 1968, pp. 259, 260*).—Differences in the growth rate of large and small races of rabbits are shown to be consistent from birth to 200 days of age.

Why there is not a difference in the appearance of cocks and hens in guinea fowls and what the nature of the so-called secondary sex characters in the fowls is in general [trans. title], J. KŘÍŽENECKÝ and L. F. KAMENÍČEK (*Sborn. Českoslov. Akad. Zeměděl. (Ann. Czechoslovak Acad. Agr.), 7 (1932), No. 2–3, pp. 147–187, figs. 9; Eng. abs., pp. 186, 187*).—Studies of the influence of castration on male and female guinea fowls showed that plumage and comb characters were in general unaffected by the operation. This led to the suggestion of three plumage types of fowl, which exhibited the following characteristics: (1) Primary sexual uniformism (guinea fowl and pigeons), (2) sexual dimorphism (common fowl, ducks, pheasants, etc.), and (3) secondary sexual uniformism (Sebright bantams).

Light or exercise as factors in sexual periodicity in birds? T. H. BISSONNETTE (*Science, 76 (1932), No. 1968, pp. 253–255*).—The author discusses the part played by exercise and light on sexual activity in birds and rats, and concludes that it is the radiation changes which bring about development of the sex glands which, in turn, influence voluntary exercise.

Further studies of the ovaries of monkeys, E. ALLEN, A. W. DIDDLE, and W. C. BALTZELL (*Soc. Expt. Biol. and Med. Proc., 29 (1932), No. 8, p. 932*).—Preliminary results of studies of the hormone content of the follicles in the ovaries indicate that the theelin is in a higher concentration in the follicles of monkeys than in the follicles of pigs.

FIELD CROPS

[Agronomic experiments in Idaho in 1931] (*Idaho Sta. Bul. 192 (1932), pp. 19–21, 39, 40, 41, 44–47*).—Research with field crops (E. S. R., 66, p. 220) reported on again from the station and substations included breeding work with wheat, oats, barley, potatoes, and reed canary grass; variety tests with wheat, oats, barley, field and garden peas, soybeans, potatoes, and carrots; cultural (including planting) tests with wheat, soybeans, potatoes, carrots, and red clover; trials of crop combinations; comparison of chopping alfalfa hay from the field and later from the stack; seed treatments with barley and potatoes; gypsum v. sulfur applications for alfalfa; crop rotations; and weed control experiments. The cereal improvement work and a red clover irrigation experiment were in cooperation with the U. S. Department of Agriculture.

[Field crops experiments in Kentucky] (*Kentucky Sta. Rpt. 1931, pt. 1, pp. 22, 23, 26, 27, 29, 30, 35, 36, 56–58*).—Progress is reported on agronomic research (E. S. R., 66, p. 130) at the station, the Western Kentucky Substation, and outlying fields, embracing studies of the effect of chlorine in fertilizers on chlorine content and quality, effects of mosaic and liming on yield and quality, methods of applying fertilizers, and fertilized rotations, all with tobacco; breeding work, manured rotations, effects of legumes in rotation on yields, and planting tests, all with corn; variety and fertilizer trials with sorgo for sirup; planting tests with potatoes; and forage crop investigations, including pasture studies, improvement of bluegrass, effect of liming on hay production, and trials of mixtures of grasses and legumes for hay variously fertilized.

[Farm crops work in Michigan], H. C. RATHER (*Michigan Sta. Rpt. 1931, pp. 282–284*).—Experiments with field crops reviewed briefly as heretofore (E.

S. R., 65, p. 729) included variety trials with corn, wheat, oats, barley, beans, and alfalfa by G. F. Wenner; breeding work with corn for resistance to European corn borer by A. R. Marston; cultural tests with sugar beets by J. G. Lill and with beans by H. R. Pettigrove; pasture studies by A. B. Dorrance; seed treatment, spraying, and improvement of potatoes by H. C. Moore and E. J. Wheeler; control of quack grass by A. M. Berridge and C. R. Megee; and comparisons of Jerusalem-artichokes with sunflowers and rutabagas by B. R. Churchill. Some of the research was in cooperation with the U. S. Department of Agriculture.

[Agronomic work in Mississippi, 1932], C. F. Briscoe, W. E. Ayres, O. K. Morgan, S. J. Greer, H. F. Wallace, and J. C. Robert (*Mississippi Sta. Rpt. 1932, pp. 11, 12, 18–20, 44, 45, 46, 47, 49–51, 54–57, 58, 59, 61, 62*).—Field crops experiments again reported on from the station (E. S. R., 66, p. 729) and substations (E. S. R., 67, pp. 28, 29; 68, p. 34) comprised breeding work with corn and cotton; inheritance studies with cotton; variety trials with cotton, corn, oats, sorgo, soybeans, alfalfa, vetch, Austrian winter peas, potatoes, sweetpotatoes, and sugarcane; cultural (including planting) tests with cotton and alfalfa; production tests with Jerusalem-artichokes; fertilizer trials with cotton, corn, alfalfa, potatoes, and sweetpotatoes; cotton following winter legumes; seed treatment of cotton; curing studies with sweetpotatoes; interplanting tests of corn with legumes; soybean oil studies; studies of root tubercle bacteria of the soybean and cowpea groups; and crop rotations.

[Crops experiments at Rothamsted, 1931] (*Rothamsted Expt. Sta., Harpenden, Rpt. 1931, pp. 20–34, 36–38, 57–61, 117–137, 141–159, 166–195, 197, 198*).—Research with field crops (E. S. R., 67, p. 123), reported on again from the station and outlying fields, included fertilizer experiments with wheat, barley, oats, potatoes, sugar beets, mangels, swedes, alfalfa, and hay; effects of fertilizers on the maturation of barley; establishment, fertilization, and use of grassland; fertilized crop rotations; effects of rotational fallow on weed population; cultural tests with wheat and sugar beets; trials of forage mixtures; inoculation experiments with alfalfa; and studies on field plat technic and of the accuracy of field experiments.

[The Woburn field experiments, 1931], J. A. Voelcker (*Rothamsted Expt. Sta., Harpenden, Rpt. 1931, pp. 93–106, 138–140, 160–165, fig. 1*).—Yields in the fifty-fifth year of continuous wheat and barley on Stackyard field treated with different fertilizers and manure, the third crop after two years of fallow, are tabulated and discussed as in previous reports (E. S. R., 67, p. 123). Other investigations reviewed were crop rotations, green manuring trials, and fertilizer tests with sugar beets and pasture. The operation of the Woburn Experimental Farm is again described by H. G. Miller.

[Forage crops investigations in Wales] (*Welsh Jour. Agr., 6 (1930), pp. 130–249, pl. 1, figs. 8; 7 (1931), pp. 142–219, 229–276, pl. 1; 8 (1932), pp. 84–102, 124–196, 229–232*).—Various phases of research with different forage crops, meadows, and pastures are reported on severally from the university colleges at Aberystwyth, Bangor, and Cardiff, the Madryn Castle Farm School, and the Welsh Plant Breeding Station.

Volume 6 includes the following articles: Nationality Trials with Cocksfoot and Observations on the General Bearing of the Relationship of Stem Shoots to Leaf Shoots, by R. G. Stapledon (pp. 130–140); Perennial Rye-grass at Aberystwyth, by T. J. Jenkin (pp. 140–165); The Effect of Different Cutting and Manurial Treatments on the Tiller and Root Development of Cocksfoot, by R. G. Stapledon and W. E. J. Milton (pp. 166–174); The Influence of Date of Sowing on the Permanency of Certain Legumes as Constituents of Pastures,

by M. T. Thomas (pp. 175–182); The Effect of Cutting to the Ground Level upon the Growth of Established Plants of *Dactylis glomerata* and *Phleum pratense*, by M. A. H. Tincker (pp. 182–198); A Comparative Study of the Effects of Artificial Manures on the Botanical Composition of the Herbage in an Old Pasture, by E. Jones (pp. 198–208); The Recovery of Nitrogen in Pastures from the Application of Nitrogenous Manures, by T. W. Fagan and R. O. Davies (pp. 208–223); The Effect of Cutting Sainfoin at Different Stages on the Yield and Chemical Composition of Hay and Aftermath, by T. W. Fagan and J. Rees (pp. 224–237); and The Chemical Composition of Barley Grain and Straw Grown in Mid-Wales, by T. W. Fagan and J. E. Watkin (pp. 237–249).

Volume 7 includes the following articles: Observations on the Effect of Various Manures on (A) Yield of Hay and (B) Botanical Composition of the Herbage of Meadow-land, by R. A. and E. J. Roberts and I. G. Lewis (pp. 142–155); Experiments on the Depth of Sowing and the Time of Sowing Sainfoin, by J. Rees (pp. 155–168); "Suction-force" Measurements on the Seeds of Some Strains of Grasses, by H. G. Chippindale (pp. 168–182): Simple Seeds Mixtures Containing Pedigree and Indigenous Strains Compared with Ordinary Commercial Mixtures for Permanent Grass, by M. T. Thomas (pp. 182–186); The Effect of Sowing Wild White Clover on the Meat Producing Capacity of a Temporary Pasture, by E. J. Roberts (pp. 187–194); Manuring Pedigree Grasses for Seed Production, by G. Evans and R. A. Calder (pp. 195–208); Seed Production of Pedigree Grasses in Montgomeryshire, by G. Evans (pp. 208–219); The Distribution of the Nitrogenous and Mineral Constituents in the Oat Plant at Different Stages of Growth, by T. W. Fagan and J. E. Watkin (pp. 229–246); The Chemical Composition of Eleven Species and Strains of Grasses at Different Stages of Maturity, by T. W. Fagan and W. E. J. Milton (pp. 246–255); The Chemical Composition of Pasture Grass under Different Systems of Management, by T. W. Evans (pp. 255–267); and The Recovery of Nitrogen in Pastures from the Application of Nitrogenous Manures—Part II, The Recovery of Nitrogen in Ordinary Swards, by T. W. Fagan and R. O. Davies (pp. 268–276).

Volume 8 includes the following articles: I, The Effect of Wild White Clover on the Live Weight Increments from a Temporary Pasture; II, A Comparison of Temporary and Permanent Pasture, by E. J. Roberts (pp. 84–93); Further Tests of Nationality and Strain in Grasses, by R. A. Roberts and I. G. Lewis (pp. 94–102); In Quest of the Best Sainfoin, by J. Rees (pp. 124–139); Italian Rye-grass for Winter Keep, by M. Griffith and M. Jones (pp. 139–144)); The Chemical Composition of the Miscellaneous Herbs of Pastures (pp. 144–151) and The Effect of Manures on the Nitrogen and Mineral Content of the Produce of Contrasting Pasture Types (pp. 192–196), both by T. W. Fagan and H. T. Watkins; Chemical Composition of Various White Clovers and of Italian Rye-grass, by R. D. Williams and T. W. Evans (pp. 151–162); Effect of a Nitrogenous Manure on White Clover and a Comparison of the Productiveness of Four Types of White Clover under Simulated Pasture Conditions, by R. D. Williams (pp. 163–170); The Yield and Response to Manures of Contrasting Pasture Types, by W. Davies and T. E. Jones (pp. 170–192); and The Eradication of Bracken, by M. Griffith, W. Evans, and E. E. Williams (pp. 229–232).

Cereal variety experiments at North Platte, N. E. Jodon (*Nebraska Sta. Bul. 272 (1932), pp. 35, fig. 1*).—Varietal comparisons carried on in cooperation with the U. S. Department of Agriculture within the period 1924 to 1931 are summarized. Earlier tests have been noted (E. S. R., 49, p. 527). The several crops, ranked in order of productiveness, were corn, winter wheat, barley, grain sorghum, spring wheat, and oats. Outstanding varieties included Substation White corn for dry land, and Substation Yellow and certain hybrids for irri-

gation; feterita of the grain sorghums; Nebraska 60 and local strains of Turkey winter wheat for corn ground; Ceres spring wheat; Trebi and Comfort barley; and Burt and Nebraska 21 oats. Other high-yielding varieties and strains were inferior in one or more agronomic characters to the sorts listed or had not been tested conclusively.

The cotton plant, III, R. C. P. Boone (*Le Cotonnier. Paris: Soc. Éd. Géogr. Marit. et Colon. 1932, vol. 3, pp. 259, pls. 102, figs. 24*).—Volume 3 of this work (E. S. R., 65, p. 223) treats of the ginning and baling of cotton, condition and tare of bales, the economics of the ginning industry, and an accounting system for gins.

Life history and habits of crested wheatgrass, L. D. Love and H. C. Hanson (*Jour. Agr. Research [U. S.], 45 (1932), No. 6, pp. 371–383, figs. 9*).—The seed and inflorescence of crested wheatgrass (*Agropyron cristatum*) (E. S. R., 67, p. 518) and the development and morphology of the seedling and mature plant are described from studies at the North Dakota Experiment Station.

The seed may be distinguished from those of *A. repens*, *A. smithii*, and *A. tenerum* by its rolled lemma and palea, its wide blunt base, and the characteristic oblong shape of the apex of the rachilla segment. The seedlings grow much more slowly than bromegrass seedlings during the first 24 days, but from then on at the same rate or even faster. Characters distinguishing very young seedlings of crested wheatgrass include the greenish-pink coleoptile, the three veins in the first leaf, and slenderness of the entire plant. The root system of crested wheatgrass at the end of the second season extended down 8 ft., with a lateral spread from the crown of over 2 ft., and the working level was about 3.3 ft. The entire system had very many fine secondary and tertiary branches. It was also observed that the seed held in cool dry storage may be expected to germinate satisfactorily until four years of age, and that the optimum planting depth is 0.25 to 0.5 in., varying with the dryness of the surface soil.

Size of seed piece and sprout removal in relation to sprout formation on Jerusalem artichoke tubers, V. R. Boswell (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 291–296*).—Tubers of White Improved Jerusalem-artichokes weighing about 10, 20, 30, 40, and 60 g were planted in comparison with tubers of the same weights cut in halves in moist sand on a greenhouse bench and covered with moist peat moss, and five successive crops of sprouts were collected. Most of the 5-g pieces and over half of the 10- and 15-g pieces had decayed between the fourth and fifth crop of sprouts. The tubers appeared to be so nearly exhausted upon harvesting the fifth crop that the study was terminated. Except with very large tubers, cutting in half resulted definitely in a greater number of sprouts produced, and in all sizes a greater weight of sprouts.

The total number of sprouts per piece increased from about 8 for 5-g pieces to 55 for 70-g pieces, although sprout size and tuber size were not consistently related. The number and weight of sprouts produced per unit weight of seed piece were about twice as great in the 5-g as in the 70-g size. In the other sizes they fluctuated considerably, but in general varied inversely with the size of seed piece. In each crop of sprouts the number per piece increased consistently with size of tuber, although the smaller tubers produced more sprouts in proportion to tuber weight.

Length of rest period of the tuber of Jerusalem artichoke (Helianthus tuberosus L.), V. R. Boswell (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 297–300*).—Tubers of 145 varieties or forms of Jerusalem-artichoke, collected

by D. N. Shoemaker, were planted in moist soil on greenhouse benches on December 1, with temperatures of 60 to 65° F. at night and 70 to 75° in the day throughout winter and early spring. The first sprout appeared in 2 lots at 31 days, in 3 at 40 days, and in 21 at 94 days, while 10 lots showed no sprouts for 172 days. The time required for sprouting 50 per cent of the tubers in the lot was considered the best index of length of rest period. In general, lots producing the first sprouts early showed additional sprouting tubers in fairly rapid succession and reached the 50 per cent or all-sprouted stages correspondingly early. Considering the 90 strains in which all sound tubers had produced sprouts by the end of the study on July 13, the mean time required for the first sprout to appear was 87 days, for 50 per cent 120 days, and for all tubers 155 days. When the 145 lots were considered the respective averages were 85, 130, and 175 days. No apparent correlation was indicated between yielding capacity and length of rest period, although the rest period of most good varieties is relatively long, 5 to 6 months, if the tubers are not subjected to low temperature.

Apical dominance in the tuber of the Jerusalem artichoke (Helianthus tuberosus L.), V. R. Boswell (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 301–304*).—Study of the number, weight, and position of five successive crops of sprouts on large tubers of White Improved Jerusalem-artichokes suggested that individual branches of multiple-branched tubers are apparently dominant over no other branches. A partial apical dominance seemed to exist within the individual branch, since about twice as many apical sprouts as medial and basal sprouts were produced in the first three crops. There was only a slight loss of the partial apical dominance after the removal of three to four crops of sprouts.

The influence of growth stage and frequency of cutting on the yield and composition of a perennial grass, Phalaris tuberosa, A. E. V. Richardson, H. C. Trumble, and R. E. Shapter (*Aust. Council Sci. and Indus. Research Bul. 66 (1932), pp. 35, figs. 10*).—In studies at the Waite Agricultural Research Institute, the growth stage exercised a determining influence on the composition of this grass, especially on the protein, crude fiber, carbohydrate, and mineral content. The crude protein content of the herbage fell from 33 per cent at early tillering to 3.37 at maturity, while the percentages at tillering of crude fiber (15.88), and nitrogen-free extract (34.65) rose at maturity to 26.71 and 57.75, respectively. The phosphorus and potassium contents of the dried herbage were very high early in growth and fell steadily to a minimum at maturity. Nitrogen assimilation was very active in relation to carbon assimilation and transpiration. The amount of nitrogen and phosphorus in the herbage at maturity was considerably less than at an earlier growth stage; there was a downward migration of portions of these elements from the herbage to the basal portion of the stem and to the root system, rather than a loss. With potassium, however, a substantial and absolute loss occurred from all portions of the plant during the final growth stage. This loss, equal to 27.8 per cent of the total intake, is regarded as a migration of potassium from the plant to the soil.

When *P. tuberosa* was subjected to several systems of defoliation, the yield of herbage, basal internodes, and roots was reduced considerably by increasing the number of cuts, while the actual yield of protein was greatly increased. The yield of phosphorus in the herbage was increased by moderate cutting. The yield of nutrients per liter of water transpired was increased greatly by the more frequent cutting. Considering yield of dry matter and of nutrients, conservation of water in relation to nutrients, and persistence in an arid

environment, a system of three cuttings probably would give optimum results with *P. tuberosa*.

The distribution and adaptation of Poa bulbosa in the United States and in foreign countries, H. A. SCHOTH and M. HALPERIN (*Jour. Amer. Soc. Agron., 24 (1932), No. 10, pp. 786–793*).—Observations on *P. bulbosa* (chiefly *vivipara*) in the United States, supplemented by data in the European literature and from unpublished sources, indicated a wide distribution for this grass. It is found on many soil types, in diverse situations, and at elevations from sea level to above 10,000 ft., and is distributed widely over the earth. While the growth and stands in the first year after planting quite often are small and spotted, its dual multiplication habit makes possible a fairly rapid increase of plants. *P. bulbosa* is currently the most widely used and of greatest farm value in the United States in southern Oregon and northern California. See also earlier notes (E. S. R., 59, p. 524; 61, p. 224; 65, p. 633; 66, p. 733).

A late crop of potatoes for Oklahoma, G. W. COCHRAN (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 257–260*).—Whole potatoes, either northern-grown seed held in storage until planting time or second crop Oklahoma seed held until the next August, gave consistently better results in Oklahoma Experiment Station studies than tubers treated chemically or bruised. Ammonium sulphocyanate gave better results than other chemicals in both greenhouse and field. No chemical treatment tested appeared successful enough under Oklahoma conditions to be recommended for general use.

Potatoes in irrigated rotations, D. A. SAVAGE (*Montana Sta. Bul. 263 (1932), pp. 36, figs. 6*).—Experiments with potatoes, carried on under irrigation at the Huntley Branch Station from 1912–1929, inclusive, in cooperation with the U. S. Department of Agriculture, dealt with the effects of crop sequences, continuous cropping, barnyard manure, and alfalfa. The rotation experiments were noted earlier in some detail (E. S. R., 60, p. 636; 62, p. 128).

The rotations producing the highest yields and the best quality of potatoes invariably included alfalfa, or barnyard manure, or both. Rotations containing alfalfa averaged 273.9 bu. of potatoes per acre compared with 193.9 bu. from similar sequences omitting alfalfa. Manured rotations averaged 268 bu., while similar unmanured cropping systems made 217.8 bu. The average increase in potato yields from the use of both alfalfa and manure in rotation equaled the combined gain from alfalfa and manure determined separately. In rotations where the higher yields of potatoes were due to manure and alfalfa, the yields of the crop were maintained at about the same high level and in some cases were increased throughout the 16 years, while potatoes in systems omitting manure and alfalfa declined markedly in yield.

Manure applied directly to potatoes resulted in an average increase of 78.7 bu., or 37.9 per cent, over similar unmanured sequences. Manure applied 1 and 4 years before potatoes increased yields 13.1 bu., or 5.6 per cent. Manure increased potato yields more when applied to oat stubble than to beet ground in the fall before the potato crop. Potato yields in 2-year manured rotations decidedly exceeded those in 3-year manured rotations, showing the beneficial effect of the greater total quantity of manure used in the 2-year sequence.

In rotations containing 3 years of alfalfa, potatoes averaged 302.3 bu. per acre for the 16 years, which amounted to 53.2 per cent more than in similar rotations without alfalfa, while those in rotations with only 2 years of alfalfa averaged only 236.4 bu., 23.1 per cent over similar sequences without alfalfa. Potatoes following alfalfa in the rotations outyielded those following oats, sugar beets, corn, and continuous potatoes in the order named. The lowest

yields and poorest quality of potatoes were obtained from continuous potatoes or from short rotations including neither alfalfa nor manure. Winter rye as a spring green manure depressed potato yields even lower than continuous cropping to potatoes.

Potatoes had a very beneficial effect on the soil for sugar beets, corn, and oats. Sugar beets yielded less directly after alfalfa than where potatoes intervened. Potatoes excelled beets as a preceding crop for corn but were not so good for oats.

Some effects of irrigation upon yield and quality of potatoes produced in the Yakima Valley, L. L. CLAYPOOL and O. M. MORRIS (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 249–252*).—When different irrigation treatments were given potatoes at the Washington Irrigation Substation from 1925 to 1930, inclusive, the best yields and the most U. S. No. 1 tubers were made where the soil was kept continuously moist. Any irrigation treatment resulting in a severe check in growth due to inadequate soil moisture will when growth resumes cause the formation of second growth knotty tubers. Large vines which can be kept vigorous and healthy throughout growth are a decided advantage under irrigation.

Some responses of potato plants to spacing and thinning, L. L. CLAYPOOL and O. M. MORRIS (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 253–256*).—Netted Gem potatoes were grown 1 plant per hill in hills 6, 12, 18, and 24 in. apart during 3 years. The greatest total yields and yields of U. S. No. 1 tubers were produced in the 6-in. spacings. Total yields gradually decreased as the planting distances were wider, but not proportionally. An appreciable consistent increase in the number and size of tubers per hill found in wider spacings was not enough to offset the greater yield from the increased number of tubers in 6-in. spacings. With 1 to 4 plants per hill in hills 12 in. apart, the greatest yield of U. S. No. 1 tubers was produced on plats with 2 or 3 plants per hill. More tubers were produced per plant as the number of plants per hill decreased. The data indicated that size and quality of potato tubers can be regulated within limits by spacing of hills, by number of plants per hill, or by the combination of both.

The relation of solar and sky radiation, temperature, and humidity to the sun-scald of potatoes in 1931, W. M. PEACOCK, R. C. WRIGHT, and T. M. WHITEMAN (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 261–265*).—Investigations in 1931 confirmed previous findings (E. S. R., 65, p. 826) that less sunscald will occur in tubers remaining out over night than when picked up at midday after exposure to the sun for a few hours. The average percentage of sun-scald injury in tubers dug at 2.30 p. m. and picked up at 11.30 a. m. next day was 6.3 and of those dug at 8.30 a. m. and gathered at 11.30 a. m. the same day was 12.6. The tuber temperature of those dug the day before gathering was higher at 8.30 and 11.30 a. m. the day picked up than of the other lot. Storage temperatures of 40 and 60° F. practically stopped the development of the injury compared with tubers in the same lots stored at 90 and 95°.

Proceedings of the eighteenth annual meeting of the Potato Association of America (*Potato Assoc. Amer. Proc., 18 (1931), pp. 132, figs. 6*).—The eighteenth annual meeting of the association, held in New Orleans, La., on December 28–30, 1931, is reported on, and the activities of the organization and of its committees in 1931 are summarized. Papers presented include the following: Plot Technique for Field Experiments with the Potato, by J. R. Livermore (pp. 7–19); Breaking the Rest Period of the Potato, by W. Stuart and E. H. Milstead (pp. 20–30); A Field Study of Potato Tuber Defects in Western New York, by E. V. Hardenburg (pp. 31–40); Planting Potatoes in Twin

Rows, by W. M. Peacock (pp. 41–48); The Tolerance of Potatoes to Soil Reaction in Ohio by J. Bushnell (pp. 49–52); Some Climatic Factors as They Affect Potato Production in Florida, by M. R. Ensign (pp. 53–60); Blight Immune Potato Hybrids, by D. Reddick, W. F. Crosier, and W. R. Mills (pp. 60–64); Recent Investigations of Potato Calico, by D. R. Porter (pp. 65–69) (E. S. R., 66, p. 443); Yellow Dwarf and Moron Diseases of Potato in Michigan, by J. H. Muncie (pp. 70–73); Effects of Prestorage and Storage Conditions on Physiological Loss in Weight of Potato Tubers (Preliminary Report), by O. Smith (pp. 73–76); Fertilizer Placement Studies with the Potato, by W. H. Martin and B. E. Brown (pp. 77–114); and Report of the Seed Potato Certification Committee, by W. H. Martin et al. (pp. 115–124).

Grain sorghum varieties in Texas, R. E. Karper, J. R. Quinby, D. L. Jones, and R. E. Dickson (*Texas Sta. Bul. 459 (1932), pp. 50, figs. 13*).—Yield trials of grain sorghum varieties reported on for the period 1912–1931 were made by the station and the U. S. Department of Agriculture working separately and in cooperation at substations in different regions of Texas. The varieties are described with recommendations for the several parts of the State. Date-of-planting and spacing experiments have been noted (E. S. R., 65, p. 332).

Grain sorghum follows cotton and corn as the third important crop in Texas, yielding annually about 60,000,000 bu., or nearly half the crop of the United States. It is particularly adapted to the western two-thirds of Texas. Varieties indicated as best in the western part of the State, strictly a grain sorghum region, included Dwarf Yellow milo, Texas Blackhull kafir, and Spur feterita, except where chinch bugs and accompanying disease damage milo; in central and southern Texas, hegari, Spur feterita, Texas Blackhull kafir, Chiltex, and darso; and in the more humid area to the east, Shrock and darso, although hegari, Spur feterita, and kafir can be grown where bird damage is not too severe.

Calcium and hydrogen-ion concentration in the growth and inoculation of soybeans, W. A. Albrecht (*Jour. Amer. Soc. Agron., 24 (1932), No. 10, pp. 793–806, figs. 8*).—In research (E. S. R., 62, p. 226) at the Missouri Experiment Station, small quantities of calcium greatly influenced the nodulation of soybeans, an effect manifested through the plant and not the bacteria, since transplanting 10-day-old seedlings from sterile calcium-bearing sand to inoculated sour soil increased nodulation four times over plants from untreated sand. The same preliminary treatment of the plants for 10 days in a calcium-bearing medium also gave greater growth and greater nitrogen fixation in the plants' early history.

The use of electrodialyzed colloidal clay, titrated to various degrees of saturation as a means of supplying calcium at varying degrees of acidity and in different quantities per seed to supply variable amounts of available calcium, demonstrated that disease-free, apparently normal growth of the soybean is controlled by the quantity of available calcium and not by the H-ion concentration within its more common ranges. This action was limited to the ionic or adsorbed forms, mineral crystal calcium being without effect. Potassium and magnesium failed to function in this respect as did calcium. With low supplies of calcium per plant nodulation was not possible, while with higher supplies both growth and nodulation resulted. The function of calcium in the growth of legumes evidently is to supply the element calcium, which seems to be needed more than other elements for growth, nodulation, and normal development of legumes, and not to change the soil reaction.

Impermeability in mature and immature sweet clover seeds as affected by conditions of storage, E. A. Helgeson (*Wis. Acad. Sci., Arts, and Letters,*

Trans., 27 (1932), pp. 193–206).—Studies of sweetclover seed subjected to various conditions of desiccation and storage indicated that the change from the permeable to the impermeable state takes place as a final step in the maturation of the seed. The assumption of the impermeable state can be prevented by storage in a cool moist place or induced by storage in a dry place. Storage for 16 months in a moist cold room notably reduced the viability of permeable seeds, while dry storage for the same time had little effect on the impermeability of hand-picked seeds or on their viability. The viability of scarified seeds was reduced greatly under all storage conditions, and storage out-of-doors reduced the percentage of impermeable seeds in all mature and immature lots.

Proximal dominance in the sweet potato, R. C. THOMPSON and J. H. BEATTIE (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 270–275*).—The proximal end of the enlarged root of the sweetpotato (*Ipomoea batatas*) is strongly dominant in the production of draws or sprouts. The cutting of roots in 2, 3, and 4 pieces resulted in sprout production throughout the entire length of the root and in comparable numbers on the various sections. In the 3- and 4-piece lots the two end pieces tended to produce slightly more sprouts than the middle sections, even though the pieces were about equal in size. The removal of a small amount of tissue from the proximal end of the root also sufficed to break the dominance. Complete severing of the root seemed necessary to break the dominance; girdling was not enough. The reduction in grams of seed stock required per plant from 19.4 in whole roots to 13 per plant in roots cut in 3 pieces showed a saving of about 33 per cent in seed stock. Loss from decay which may enter the cut surfaces must be considered in the practical use of this method of increasing sprout production.

Seedling hairiness as a varietal identification character in wheat, J. B. HARRINGTON (*Sci. Agr., 13 (1932), No. 2, pp. 119–125, fig. 1*).—By using a preliminary key of western Canadian hard red spring wheat varieties made with respect to coleoptile coloration and seedling hairiness, Marquis and Reward seedlings could be separated accurately within a day of emergence, whereas separations of Marquis from Garnet, and Garnet from Reward, were less successful. Possibilities of the seedling hairiness test in the seed and grain trade are discussed briefly.

A new wheat for Georgia, R. P. BLEDSOE (*Georgia Sta. Bul. 171 (1932), pp. 16, figs. 7*).—Gasta wheat, a pure line selection from Purplestraw, selected in 1921 at the station, is described as very similar to Purplestraw in growth habit but producing a higher yield. While susceptible to rust, Gasta matures early and usually escapes serious damage from this cause. Although thorough tests for resistance to loose smut had not been made, field observations indicated that Gasta is resistant to strains present at the station. Both Gasta and Purplestraw are adapted to all sections of Georgia.

Practical information included on wheat growing in Georgia considers soils, rotations, fertilizers, cultural methods and harvesting practices, insect pests, smuts, and rust.

Report of operation, State testing mill, crop season of 1930, H. A. HALVORSON (*Minn. Dept. Agr., Dairy, and Food Bul. 7 (1932), pp. 50, figs. 6*).—The current and early activities and the equipment of the Minnesota State Testing Mill are summarized, with a report of investigations on the 1930 wheat crop.

Tests on 51 car lots of hard red spring wheat from Minnesota, North Dakota, and South Dakota, and 1 car of hard winter wheat from Minnesota, showed averages for weight per bushel 59 lbs., moisture content 11.3 per cent, flour yield 74.09 per cent, and ash content of wheat 1.692 and of flour 0.515 per cent.

Compared with results in previous crops, flour from the 1930 crop in general had very good baking characteristics, better texture and color, and higher loaf volume and absorption. The 1930 crop was comparatively low in diastatic activity and but slightly higher than the 1925 crop in average hydrogen-ion concentration. The yield and value of products from different grades of wheat are discussed in some detail. Routine tests on the winter wheat showed unsatisfactory milling character and poor baking results, possibly because of low protein content and other causes. Marquillo wheat compared favorably with Marquis except in color and ash content.

Results of seed tests for 1932, B. G. Sanborn and L. J. Higgins (*New Hampshire Sta. Bul. 267 (1932), pp. 16*).—Tables show the percentages of purity and germination for 357 official samples of field crops seed collected from dealers in New Hampshire during the year ended June 30, 1932.

Weeds and their control (*Brit. Columbia Dept. Agr. Bul. 106 (1932), pp. 54, pls. 20, figs. 11*).—Descriptions and control methods are given for 85 weeds considered more or less important in British Columbia.

HORTICULTURE

The vegetative propagation of plants, F. E. Gardner (*Maryland Sta. Bul. 335 (1932), pp. 79–111, figs. 14*).—Designed as a source of general information on vegetative propagation and as an aid to the amateur plant grower, this bulletin presents information on the principles and practices of asexual propagation of various ornamental and fruit bearing plants.

The rôle of acetaldehyde in the respiration of plants, S. A. Trout and F. Kidd ([*Gt. Brit.*] *Dept. Sci. and Indus. Research, Food Invest. Bd. Rpt. 1931, pp. 78–85, figs. 2*).—Asserting that there is a normal equilibrium content of acetaldehyde in the tissue of fruits and that this rises in overripe, diseased, or oxygen excluded tissues, the authors report that in fruits stored in acetaldehyde vapors of different concentrations the entering acetaldehydes were oxidized at the lower concentrations while at higher levels there was an increase in the production of carbon dioxide. Under normal aerobic conditions the author believes that acetaldehyde is removed from the system by oxidation and does not react with methylglyoxal to set up the secondary cycle, leading to the formation of alcohol. By artificially raising the equilibrium content of acetaldehyde the secondary cycle is activated, even in the presence of oxygen, with the consequent formation of alcohol.

Effect of carbon dioxide content of storage atmosphere on carbohydrate transformation in certain fruits and vegetables, E. V. Miller and C. Brooks (*Jour. Agr. Research [U. S.], 45 (1932), No. 8, pp. 449–459, figs. 4*).—Observations on the carbohydrate changes in peas, sweet corn, peaches, and cherries held for definite periods in jars in which the temperature and the percentage of carbon dioxide were maintained at constant levels showed by far the most pronounced effects in the vegetables. Employing a temperature range of 0, 5, 10, 15, 20, and 25° C., the greatest effects of the carbon dioxide on carbohydrate composition of peas occurred at the higher points and with sweet corn at the lower part of the range. Carbon dioxide concentrations of 35 to 47 per cent had no significant influence on the percentage of reducing sugar, total sugar, or acid-hydrolyzable polysaccharides in sweet and sour cherries and peaches but did retard the sugar loss in peas and sweet corn. At temperatures of 15 and 20°, 35 to 47 per cent of carbon dioxide in the atmosphere produced an overripe flavor in peaches but had no such effect on the cherries. The flavor of Gradus and Nott Excelsior peas and Early Evergreen corn held at 15 and 25° was not influenced by carbon dioxide percentages of 43 to 47. At these concentra-

tions and at 5° peas retained their flavor for 3 days and sweet corn for 4 days. The Golden Bantam sweet corn was more sensitive than Early Evergreen to the carbon dioxide treatments. Within the limits of tolerance the treated sweet corn appeared somewhat sweeter than the control.

A cytological study of the effect of freezing temperatures on some plant tissues, U. Tetley ([*Gt. Brit.*] *Dept. Sci. and Indus. Research, Food Invest. Bd. Rpt. 1931, pp. 105, 106*).—Microscopical studies of the flesh of apples and onions stored at —5° C. showed visible injury to the protoplasts prior to the formation of ice, evident in a coagulation followed by rapid development of brown coloring within about 20 minutes after exposure. Ice formed first on the external surface of the walls surrounding the intercellular spaces. When surrounded by a nonfreezing sucrose solution, apple and onion cells withstood temperatures as low as —10°, but were plasmolyzed. Coagulation of the protoplast always occurred before the contents of the vacuoles froze.

The preservation of fruits and vegetables in the frozen state, T. N Morris and J. Barker ([*Gt. Brit.*] *Dept. Sci. and Indus. Research, Food Invest. Bd. Rpt. 1931, pp. 129–133*).—Of various fruits and vegetables studied, raspberries were the only product not to undergo more or less marked autolytic changes when frozen, even as low as —20° C. Partial cooking or blanching was found a satisfactory method of preventing such changes, and with peas, beans, and potatoes yielded a product superior to canned materials. Blanching is conceded practicable for fruits such as plums and cherries which ordinarily deteriorate in flavor and color when frozen raw. Since neither storage in vacuum at —20° nor rapid freezing at —28°, —70°, or in liquid air had any permanent inhibiting effect on the autolytic enzymes, nor did quick freezing improve the texture of the product after thawing and cooking, the authors question the value of the quick freezing method of preservation.

[Horticulture at the Idaho Station] (*Idaho Sta. Bul. 192 (1932), pp. 32–34*).—Brief reports are given on maturity and storage studies with prunes and apples.

[Horticulture at the Kentucky Station] (*Kentucky Sta. Rpt. 1931, pt. 1, pp. 25, 31–34, 35, 36, 54, 59, 60*).—Included in this report are discussions of boron as a factor in the growth of lettuce; the comparative merits of the Blakemore and Premier (Howard 17) strawberries; summer and winter cover crops for peach ochards; the thinning of peach fruits; the relation of shoot growth to fruit size in peaches; the value of sodium carbonate as a supplement to lime and manure in fertilizing vegetables; the relation of nitrate, phosphate, and soluble carbohydrate ratios in the petioles of tomatoes to growth and yield; cultural and fertilizer tests with peaches and strawberries; and the growth and survival of black walnut, black locust, and various native and introduced forest species.

[Horticulture at the Michigan Station] V. R. Gardner (*Michigan Sta. Rpt. 1931, pp. 288, 289*).—Brief reports are presented on breeding and varietal studies with fruits and vegetables, on plant selection in the black raspberry, on the loss of pressure in incorrectly designed spray outfits, on the thinning of plums, on the influence of fertilizers and soil on the growth and yield of Concord grapes, on grit cell formation in the Kieffer pear, and on the hardening off of chrysanthemum plants.

[Horticulture at the Mississippi Station], R. V. Lott, T. E. Ashley, J. B. Edmond, R. O. Monosmith, W. E. Ayres, S. J. Greer, H. F. Wallace, and J. C. Robert (*Mississippi Sta. Rpt. 1932, pp. 34–37, 38, 39, 45, 51, 52, 57, 58, 63, 64*).—Information is presented on the influence of nitrogen fertilizers on growth and fruiting of the peach; on the use of solar heat in hotbeds; on head lettuce

adaptation and strain tests; on tests of nitrogen fertilizers for potted plants; on variety tests at the Delta Substation with tomatoes and peaches; on variety and cultural trials with vegetables and pecans at the Natchez Substation; on variety and fertilizer studies with tomatoes, peas, and beans at the Raymond Substation; and on cultural and fertilizer studies with tung-oil trees at the South Mississippi Substation.

Breeding plants of the cabbage group, O. H. Pearson (*California Sta. Bul. 532 (1932), pp. 22, figs. 6*).—Beginning with a discussion of the botanical characteristics of the cabbage bloom and of the technic employed in breeding, the author states that cabbage pollen retained its viability for 6 to 7 days at 50° F. and for 2 days at 39 and 95°. The optimum germination was secured at 68° in a 20 per cent sucrose solution. That self-pollination is decidedly less effective than cross-pollination was shown in double-pollination tests employing green and red varieties. In this case only 6 per cent of the resulting seedlings were of selfed parentage. Two programs of breeding *Brassica oleracea* are proposed which take into account the compatibility relationships of this species.

Changes in the composition of the garden pea after harvest, H. A. Jones and C. S. Bisson (*Plant Physiol., 7 (1932), No. 2, pp. 273–283*).—Studies at the California Experiment Station of the changes occurring in the pods and seeds of shelled and unshelled Dwarf Telephone peas showed that a temperature of 0° C. practically brings to rest various changes in carbohydrate composition associated with edibility. Cooked after one week at 0° peas still possessed excellent quality. The most rapid loss in sucrose in peas occurred at 25°. Starch increased in the peas at higher temperatures, probably due to the condensation of the sugars. Comparing peas in the pod and those shelled, it was evident that changes progress more rapidly in the shelled product. In pods the percentage of starch decreased at all temperatures, but least at 0°.

Deterioration in shelled green peas held a few days in storage prior to canning, Z. I. Kertesz and E. L. Green (*Jour. Agr. Research [U. S.], 45 (1932), No. 6, pp. 361–370*).—Observing that the changes which occur in shelled peas are rapid and complex, studies were made by the New York State Experiment Station of the comparative effects of (1) holding peas at room temperature without treatment, (2) cooling and storing peas at 30° F. without blanching, and (3) cooling and storing peas at 30° with blanching. Peas chilled quickly to 30° and held at that temperature kept without apparent deterioration for several days. Blanching before cooling further delayed deterioration.

The percentage and absolute amount of total sugars in the unblanched, chilled sample decreased during storage, indicating the continuance of respiratory activity. The absence of sugar changes in the blanched and chilled peas suggested that the respiratory enzymes were inactivated by heating for 5 minutes to 180°. That there was no conversion of sugars to starch in shelled and stored peas was indicated by no increase in the percentage and absolute amount of starch per pea. The observed changes in quality could not be directly associated with chemical changes.

The authors believe that the changes occurring in peas held in cold storage may result from one or two conditions, namely, the direct oxidation by oxygen of the air independently of respiration or other enzyme action and the injury of the outer epidermis during the process of mechanical shelling.

Some photoperiodic and temperature responses of the radish, T. M. Plitt (*Plant Physiol., 7 (1932), No. 2, pp. 337–339, fig. 1*).—The exposure at the University of Chicago of radish plants held at 25 and 15.5° C. to 15 and 7.5 hours of daylight resulted in favorable root enlargement in both photoperiods

at the lower temperature and poor development for both photoperiods at the higher temperature. The thickened roots contained a little fructose and much glucose, and the slender roots an abundance of very small starch grains in the parenchymatous tissues. Temperature apparently influenced the form in which carbohydrates were stored, and very markedly the thickening of the roots.

Grafting and budding fruit trees, I. P. LEWIS (*Ohio Sta. Bul. 510 (1932), pp. 22, figs. 10*).—A general discussion is presented upon the principles and practices of propagating fruit trees, supplemented by certain experimental results. Scions coated with paraffin before storing were superior to those stored without such coating and practically equal to freshly cut material, especially when used in March and April. By using basal growth from small 2-year or 3-year twigs containing latent, dormant buds and coating the scion and cut surfaces with wax, successful grafts were made every month from November to August. For practical purposes early spring is conceded the best time to graft. Waxing scions greatly increased the percentage of success. A mixture of 4 parts paraffin and 1 part Pick-up Gum was successful as a coating wax.

Notes on the 1930 drought in West Virginia orchards, L. VERNER (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 646–653, fig. 1*).—Stating that apples suffered much more than peaches and sour cherries from drought, the author compares precipitation in West Virginia in 1930 with that in other fruit-producing regions and concludes that factors besides moisture deficiency must have contributed to the severe injury. It was evident that orchards located on high ground, shallow soil, or in situations ordinarily very moist suffered most severely. Varieties differed sharply in their susceptibility to drought injury, Ben Davis being the most and York Imperial the least susceptible of those studied. Of effects on growth, depressed terminal development was one of the earliest responses and was more noticeable the succeeding year than during the drought. Except for injured trees, there was no hold-over effect on trunk-circumference increment.

The respiration of some fruits in relation to temperature, M. H. HALLER, P. L. HARDING, J. M. LUTZ, and D. H. ROSE (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 583–589*).—Data presented by the U. S. Department of Agriculture on the respiratory activity of strawberries, peaches, lemons, oranges, and grapefruit showed some striking differences in behavior of the various fruits. Strawberries increased in respiration rate at temperatures of from 40 to 80° F. Peaches behaved much the same at 32 and 40° with a gradual increase above these degrees, except with Carman at 80° where a decline was recorded from the first to the fourth day. The respiration rate of Eureka lemons was practically constant at 32, 40, 60, and 70°, with gradual increases at 50 and 100° and decreases at 80 and 90°.

The respiration ratio of the strawberries was about 1.3 at most of the temperatures and of Carman peaches 1, with Belle, Elberta, and Hale somewhat higher. Considerable intramolecular respiration apparently occurred in Florida oranges and grapefruits at temperatures of 90° and above and in California oranges at 100°.

Of the fruits studied peaches had the highest temperature coefficients. At 70° the respiration rate of strawberries, oranges, lemons, and grapefruits was from 7 to 8 times that at 32° and with peaches 11.5 to 16 times.

Cold storage experiments with Swedish fruits [trans. title], L. RASMUSSON (*Sveriges Pomol. För. Årsskr., 33 (1932), No. 2, pp. 49–102, figs. 20*).—Information is presented on the comparative keeping qualities of 62 apple, 22 pear, and 12 plum varieties and upon the pathological, biochemical, and anatomical changes occurring in stored fruit.

A comparison of different methods of taking samples of apples in experimental plots, M. J. Dorsey and R. L. McMunn (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 619–626*).—Using size of fruit as a criterion and the "goodness of fit" method of comparison, it was determined in these studies at the Illinois Experiment Station that large samples of apples are needed to give reliable indications of the response to treatments. Attempts to select small representative samples were not found reliable, and of the methods tested the one requiring a 200-lb. sample per tree was found most worthy if the entire crop can not be graded or sized. In obtaining the 200-lb. sample five baskets were taken at random and enough fruit removed from one basket to adjust the weight to 200 lbs.

Tabular biometrical presentation of pruning treatments with apple trees, F. W. Hofmann (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 613–618*).—A statistical analysis of records taken in a York Imperial and Stayman Winesap orchard planted by the Virginia Experiment Station in 1915 showed a significant yield gain in both varieties for unpruned trees as compared with those pruned June 20, August 20, and October 20. The results favored low heads over high heads and light pruning over heavy pruning, and suggested that under Virginia conditions higher yields may be expected from low-headed trees that are dormant pruned with intelligent moderation.

Results of some experiments in pruning young apple trees, T. J. Talbert (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 610–612*).—Comparisons at the Missouri Experiment Station of different types of pruning young apple trees showed that the type which required the heaviest cutting had the greatest dwarfing effect, as indicated in height and spread of tops and trunk girth increment. Unpruned trees came into fruiting earlier and were readily distinguished by their greater height and spread.

Studies of growth and fruit bud formation, I, II, C. Barnard and F. M. Read (*Jour. Dept. Agr. Victoria, 30 (1932), Nos. 7, pp. 349–361, figs. 3; 9, pp. 463–468, figs. 2*).—These papers report respectively a year's observations on Victorian apples and pears. In the first paper information is given on the time of and the progress of fruit bud differentiation in Jonathan, Yates, and Rome Beauty apples at Templestowe and in Dunn and Cleopatra apples at Harcourt, Victoria. Initiation apparently took place five to six weeks after the spur leaves had reached their full growth. No correlation was determined between the date of fruit bud initiation and the season of blossoming. Those varieties having a second elongation of spur growth initiated their blooms over an extended period.

The second paper presents the results of studies with Bartlett (William Bon Chretien) pears in irrigated and nonirrigated districts of Victoria, Australia. Fruit bud initiation was found to take place in early December in both districts. It practically coincided with the cessation of growth in current season shoots, and occurred two weeks after the spur leaves attained full size.

Apple pollination: An evaluation of methods and pollenizers, A. E. Murneek (*Missouri Sta. Research Bul. 175 (1932), pp. 31, figs. 12*).—Of three methods of pollination, namely, branch unit, screen cage, and paper bag, employed during three years of pollination trials, the first two more closely approached results expected under natural conditions than did the paper bag method. When flowers are hand pollinated and covered with bags the set may be either above or below the natural yields, and this situation is believed to account to some extent for the wide divergence in results as reported by different investigators. The screened cage-package bee method of pollination, in which the entire tree is covered and a hive of bees released therein, is consid-

ered ideal for pollination studies but too costly. A determination of the fruit set after the final natural drop is deemed the most reliable index to the results of self- and cross-pollination tests.

Of various varieties tested, Jonathan, Delicious, and Ben Davis were found, on the basis of 6 years' results, to be satisfactory pollinizers for most of the popular varieties grown in Missouri. York Imperial in the one year tested gave excellent results and also induced a high seed production in the crossed fruits.

Apple thinning with special reference to Grimes Golden and Jonathan, C. W. Ellenwood and F. S. Howlett (*Ohio Sta. Bul. 508 (1932), pp. 44, figs. 4*).—Of various distances employed in thinning Grimes Golden and Jonathan apple fruits, 10 and 8 in., respectively, gave the most favorable responses when both size and total weight of the remaining fruits were considered. Of two methods of thinning, namely, hand and shears, the former was more rapid and caused little injury to the remaining fruits. Thinning to a definite number of inches between fruits was found more practical than to a certain number of leaves per fruit. The thinning of Jonathans to any distance reduced the total weight of harvested fruits, and to a lesser extent the same results were obtained with Grimes Golden. The color of Jonathans was slightly improved by thinning, and there was some evidence that annual thinning tends to increase the size of the off-year crop.

The leaf area per fruit of Grimes Golden trees thinned in 1930 to 8 in. was approximately double that on unthinned trees, and the gain in average weight per fruit was 86 per cent. Further increases in leaf area per fruit did not give a corresponding increase in weight. In general, increase in size of fruit per unit increase in leaf area was greater with Grimes Golden than with Jonathan.

The time of thinning was an important factor with early varieties. For example, Oldenburg and Red June trees thinned before the June drop produced considerably larger fruits than those thinned afterwards. The size and freedom from blemishes were the best standards on which to base selection of fruits at the time of thinning. The beneficial effects of thinning were most pronounced in dry years.

Effect of fruit thinning upon carbohydrate accumulation, formation of fruit buds, and set of bloom in apple trees, W. W. Aldrich (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 599–604*).—In this study, conducted by the U. S. Department of Agriculture in the Shenandoah apple region, evidence was obtained that fruit thinning of vigorous apple trees generally will, if sufficient to result in a surplus of synthesized products from the leaves, increase fruit bud formation, even if done as late as July 1. In nearly all cases where trees bloomed the succeeding spring the thinned trees set a higher percentage of blooms. Trees under irrigation did not respond as markedly to thinning as did comparable nonirrigated trees. The immediate effect of thinning was to increase the size and color of the fruit and, as indicated in analyses of spurs and shoots taken from 3 to 8 weeks after thinning, the percentage of synthesized carbohydrates.

Effect of thinning before the June drop upon fruit production, F. S Howlett (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 605–609*).—At the Ohio Experiment Station 94 per cent of the clusters on a large, vigorous 37-year-old Yellow Transparent tree that were thinned to one fruit before the June drop held this single fruit to harvest, and with each progressive increase in number of apples per cluster the set decreased accordingly. Similar results were secured with Grimes Golden and Ensee. In the case of a single tree where part of the limbs were thinned to one fruit before the June drop, a high percentage

remained on the thinned branches and a much smaller percentage on the unthinned, indicating that thinning largely eliminated the June drop.

Where branches of a single tree were used, the differences in size of the remaining fruits on June 24 tended in some cases to disappear by harvest, suggesting that fruits on unthinned branches tend to be influenced by the adjacent thinned branches and that it is better to use comparable separate trees in thinning experiments. The crop in pounds per tree was greater in early-thinnd than in late-thinned trees.

Summer oil sprays for late brood codling-moth, H. G. SWARTWOUT (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 663–666*).—A comparison in 1930 at the University of Missouri of white oil emulsion of medium viscosity with arsenate of lead in the control of the second brood codling moth showed promising results with respect to insect control, but considerable foliage injury and spotting of fruit occurred on some of the oil-sprayed trees, particularly Grimes Golden. The substitution of oil sprays for lead arsenate considerably reduced the residues of arsenic, the amount being in most cases near or below the 0.01 grain per pound of fruit tolerance.

Cytological study of changes in the apple during its development on the tree, U. TETLEY ([*Gt. Brit.*] *Dept. Sci. and Indus. Research, Food Invest. Bd. Rpt. 1931, pp. 103–105, fig. 1*).—A brief account is given of the structural changes taking place in the flesh and skin of Bramley Seedling apples during development on the tree.

Chemical studies in the physiology of apples, XII, XIII (*Ann. Bot. [London], 46 (1932), No. 183, pp. 407–459, figs. 11; 597–631, figs. 5*).—These studies at the Imperial College of Science and Technology, London, are reported in two parts.

XII. *Ripening processes in the apple and the relation of time of gathering to the chemical changes in cold storage,* H. K. Archbold.—Analyses of Bramley Seedling and Worcester Pearmain apples from an unfertilized sod orchard showed no starch present during the first 3 weeks of growth; in fact 53 per cent of material other than water accumulating in this period was insoluble substance and acid. Approximately 15 per cent of the solids at the end of the first 3 weeks was sugar—fructose, sucrose, and glucose, in roughly equal amounts. Starch synthesis began after 22 days and continued for 60 and 30 days, respectively, in Worcester Pearmain and Bramley. In the same period the percentage of solids stored as sugar increased to 55 and that of acid and insoluble substance declined to about 17. During the final ripening stages over 80 per cent of the solids was stored as sugar. The rate of nitrogen intake reached a maximum after 2 weeks of growth and then declined continuously.

In fruits gathered while still containing 0.5 per cent or more of starch, the initial rate of loss of dry weight was very low. As sucrose inversion proceeded, reducing sugars increased only to decrease again when sucrose inversion failed to supply adequate sugar for oxidation. Presumably the glucose produced by inversion was oxidized in the process of conversion to fructose, and when glucose was inadequate stable fructose was drawn on. Glucose itself remained constant or increased slightly during storage. Acid and some alcohol-insoluble materials were lost continuously.

Late picking was accompanied by a low average rate of total sugar loss, a high rate of sucrose inversion, and a high level of concentration at which sucrose inversion nearly ceased. Changes in reducing sugars were also greater in late-picked fruit. The rate of acid loss was about the same in both varieties despite wide differences in concentration.

XIII. *The starch and hemicellulose content of developing apples*, E. M. Widdowson.—Observing in a series of analyses that there was a considerable increase in the amount of alcohol-insoluble material in developing apples before iodine tests revealed starch, the author developed a method of starch determination. After a preliminary extraction of the alcohol-insoluble apple residue with cold potassium oxalate solution to remove some of the pectin, the starch was hydrolyzed by taka-diastase and the glucose and maltose determined. In Bramley and Worcester Pearmain starch appeared about the middle of June, rose to a maximum, and completely disappeared by the end of October. Two water-soluble substances were isolated from apple residue that were not hydrolized by taka-diastase nor precipitated by calcium chloride. Both were found to be hemicelluloses, but since they and pectin increased steadily to a constant value which did not fall to any extent during storage, the author concludes that they are not reserve carbohydrates but are related to pectin.

Studies in the transpiration rate of apple varieties, O. J. Dowd (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 590–593*).—In this preliminary report on studies at the Oregon Experiment Station upon the transpiration of freshly cut shoots of different varieties of apples, evidence was found to suggest that apple varieties have a definite and distinctive transpiration rate. Certain varieties found to have a relatively high transpiration rate were those which commonly suffer during the hot, dry periods of late summer, and which manifest a tendency toward water deficiency diseases. No difference in average thickness of leaf could be detected for the 14 varieties under study.

The effect of stock and of manurial treatment on the composition of the apple ([*Gt. Brit.*] *Dept. Sci. and Indus. Research, Food Invest. Bd. Rpt. 1931, pp. 270–272*).—Studies of the composition of Bramley Seedling and Worcester Pearmain apples from trees on different rootstocks and from manured and unmanured trees showed greater differences in composition between the fertilized plats than between stocks. Only one stock, East Malling Type 5, varied from the others in yielding fruit of lower dry weight, total sugar and sucrose, and a higher nitrogen content. Apples from the manured trees were slightly lower in dry weight and total sugars expressed as percentage of fresh weight. Nitrogen content was little influenced by manures. Total sugar was lower, but sucrose was higher in fruit from manured plats. Manures were apparently associated with sucrose storage rather than glucose.

Internal factors determining rate of loss of water from fruit, W. H. Smith ([*Gt. Brit.*] *Dept. Sci. and Indus. Research, Food Invest. Bd. Rpt. 1931, pp. 106, 107*).—Contrary to expectation, when individual apples within a variety were compared those with the thickest cuticle lost water at the most rapid rate. The rate of evaporation per unit surface sharply increased following the death of the apple. Unit evaporation from a spherical free-water surface was 70 times that from a unit area of a Bramley Seedling apple.

The waxy coating of apples, R. Gane ([*Gt. Brit.*] *Dept. Sci. and Indus. Research, Food Invest. Bd. Rpt. 1931, pp. 242, 243*).—The yellow waxy material, obtained by ether washing, from the surface of Bramley Seedling apples was separated into an oil, a white pearly crystalline substance, and a hard, dull white powder, the chemical properties of each of which are discussed.

Volatile products of the metabolism of apples, R. Gane ([*Gt. Brit.*] *Dept. Sci. and Indus. Research, Food Invest. Bd. Rpt. 1931, pp. 241, 242*).—Various attempts, including extraction of the drip water from storage rooms, extraction of residue from air drawn through absorption bottles, and distillation of wrappers, were made with little success in collecting the volatile products given off by apples.

Comparative temperatures of apples, A. Meyer (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 566, 567*).—Thermocouple readings at the University of Missouri on 10 varieties of apples placed on 1-in. mesh poultry wire about 15 in. above bluegrass sod showed only slight differences in temperature between varieties. However, there was a general decline in temperature as the amount of red color decreased. Varieties devoid of red coloring suffered the greater sunburning.

A critical example of the effect of small differences in temperature during storage upon the storage-life of apples, F. Kidd and C. West ([*Gt. Brit.*] *Dept. Sci. and Indus. Research, Food Invest. Bd. Rpt. 1931, pp. 127, 128, fig. 1*).—Although the average temperature of six boxes of Bramley Seedling apples taken from the warmer part of a storage chamber was only 1.7° F. higher than that (37.2°) of six comparable boxes from a cooler location in the same room, the warmer fruit was considerably riper, as evidenced in color and in subsequent rate of ripening.

Humidity and the storage-life of apples, F. Kidd and C. West ([*Gt. Brit.*] *Dept. Sci. and Indus. Research, Food Invest. Bd. Rpt. 1931, pp. 107, 108*).—At a temperature of 1° C. Bramley Seedling apples kept longer at a relative humidity of 63.5 per cent than at 82.5, but with a greater loss of weight. Below 80 per cent relative humidity further decreases had no benefit with respect to preventing fungus diseases. The relative humidity range 85 to 95 per cent is that in which humidity appears to have definite effects upon fungal wastage.

Biochemical study of senescence in apples, M. Onslow, F. Kidd, and C. West ([*Gt. Brit.*] *Dept. Sci. and Indus. Research, Food Invest. Bd. Rpt. 1931, pp. 52–77, figs. 11*).—Using Bramley Seedling and Worcester Pearmain apples obtained from different localities and stored at 1° C., there was observed in the Worcester Pearmain definitely and in Bramley less conclusively an inverse relationship between the rate of loss of sugar and of acid. In both varieties long life and low residual cane sugar content were associated. In the Worcester Pearmain a consistent relationship between storage life and the average rate of loss of sugar was apparent. In Bramley apples stored at 5° both free fructose and free glucose increased during the hydrolysis of sucrose. The loss of total sugar (estimated) was equivalent to half the sucrose hydrolyzed.

From data on fruit held at seven different temperatures it is estimated that all apples were starch free when the sucrose value was at 3 g. The loss of total sugar was about equally borne by glucose and fructose. Frozen powdered tissue of Bramley apples stored at —5° lost 33 per cent of cane sugar by hydrolysis in 3 months and only 1.5 per cent in 7 months at —20°. The rate of disappearance of starch in stored apples could not be associated with differences in the relative humidity in the chamber.

Seasonal changes in the composition of the insoluble nitrogen fraction in the current year's shoots of Bartlett pear, A. S. Mulay (*Plant Physiol., 7 (1932), No. 2, pp. 323–327, figs. 2*).—Continuing work with the Bartlett pear (E. S. R., 67, p. 255), the author separated current year shoots into bark and wood and, after grinding and drying and extracting in water, studied the fractionation of the water insoluble nitrogen. The insoluble nitrogen of the bark contained from 40 to 50 per cent of amino, nearly 20 per cent of basic, from 10 to 15 per cent of melanin, from 7 to 9 per cent of amide, from 4 to 6 per cent of humin, from 5 to 10 per cent of rest, 2 per cent of alcohol-soluble, and about 0.1 per cent of benzene-soluble nitrogen. There was a slight rise in amide and humin nitrogen at the beginning of the growing season at the cost of basic and rest nitrogen, and as growth proceeded a slight fall in amino and a parallel rise in rest nitrogen.

The wood portion was composed of about 40 per cent of amino, 12 per cent of basic, 14 per cent of melanin, 10 per cent of amide, 12 per cent of rest, 4 per cent of humin, 8 per cent of alcohol-soluble, and 0.1 per cent of benzene-soluble nitrogen. Again seasonal changes were slight, except that amino nitrogen declined and melanin nitrogen increased from June to August and rest nitrogen increased after active growth ceased. The greatest differences between bark and wood were in the alcohol-soluble, rest, and basic nitrogen fractions.

Sterility of pears (*Vermont Sta. Bul. 344 (1932), pp. 19, 20*).—Data are reported on the causes and nature of sterility in pears and on the viability of pear pollen and its growth in the fertilized flower.

Variations in shape of Bartlett pears, W. P. Tufts and C. J. Hansen (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 627–633, pl. 1, fig. 1*).—During the 1931 season samples of Bartlett pears from orchards in 20 pear sections along the Pacific coast were measured by the California Experiment Station and the ratios of maximum length to maximum transverse diameter determined. Marked differences were found, the shortest fruits coming from near the coast and with few exceptions the longest fruit from the higher altitudes. However, one orchard in the short-pear district produced desirable fruits of good length. It is believed that this is a distinct strain, possibly the result of mutation.

Incidentally it was observed that any pruning system which reduces old spurs and favors young wood tends to promote longer pears. Some indication was obtained that Japanese rootstocks promote the production of short fruits. No correlation was determined between seed content and the length-to-diameter ratio.

The gas-storage of pears, F. Kidd, C. West, and S. A. Trout ([*Gt. Brit.*] *Dept. Sci. and Indus. Research, Food Invest. Bd. Rpt. 1931, pp. 92–99, figs. 7*).—Hard green Comice pears stored at 3° C. in atmospheres differing in content of oxygen and carbon dioxide were generally inhibited from ripening, the only fruit to show signs of maturing being that held in 6 and 2 per cent oxygen without carbon dioxide. Carbon dioxide in the presence of oxygen concentrations above 2 per cent markedly retarded ripening. At 10° Winter Nelis pears in 5 per cent oxygen produced 50 per cent less carbon dioxide than air-stored fruits. At 1° the carbon dioxide output of Conference pears was little affected by reducing oxygen to 5 per cent. A reduction of oxygen to 0.2 per cent resulted in complete or partial substitution of anaerobic production of carbon dioxide and alcohol formation for normal respiration. The inhibiting effect of carbon dioxide persisted after the removal of fruit to the air. Holding Winter Nelis pears in 5 per cent oxygen extended their storage life 50 per cent without loss in quality. With lower oxygen percentages pears were abnormally slow in ripening following removal to the air, and if oxygen deficiency was continued indefinitely fruit never did ripen. Measurements indicated that during normal ripening the equilibrium content of acetaldehyde rises rapidly during the final stages of maturity.

The effects of humidity and temperature upon the wetting of peach shoots, W. A. Ruth and G. V. Falkenberg (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 657–662*).—Using as material moderately vigorous shoots from the outer branches of 3-year-old peach trees, the authors found in this study at the University of Illinois that, except at high temperatures, high relative humidity promotes wetting. Temperatures above 90 to 100° F. were unfavorable even at high humidities. Even with high humidity, wetting was usually imperfect, as shown by the prolonged recession of water on the dipped areas. Improved wetting is believed to have resulted from the substitution of water for air on the surface of shoots.

From a practical standpoint, significant differences in control from spraying may result from treatments given under different atmospheric conditions because of differences in continuity of cover.

Peach maturity at harvest as related to quality, O. M. Morris (*Washington Col. Sta. Bul. 266 (1932), pp. 35, figs. 7*).—Studies continued over a 5-year period with Elberta, J. H. Hale, and other peaches gave evidence that maturity of peaches is difficult to measure accurately. Size frequently continued to increase after the fruits began to soften, and the rate of softening and of growth varied from year to year and from tree to tree, depending on weather and prevailing growth conditions. Under highly favorable conditions peaches increased more rapidly in lateral diameter during the latter part of the growth period than in length. Under less favorable conditions broadening sometimes failed to take place at all. The ease of separation of fruit from the stem was not found a constant or reliable index to maturity, nor was the pressure test of material value, since at any one date during the picking season fruits of extreme hardness and extreme softness might be found on the same tree. Color development was influenced by type of growth, load of fruit, etc., and was in itself not a reliable index. A combination of pressure test and color appeared to be the most reliable standard for use in determining the picking season.

Although peaches could not be left on the tree until fully ripe, a certain degree of maturity was necessary in order that the fruits attain ultimate quality. A temperature of 32° F. in storage prevented the development of normal ripening, while from 40 to 50° retarded softening but permitted normal maturity. The first fruits were usually of higher quality and color than the later pickings, and this difference was apparently associated with a greater exposure to light.

The McClintock strawberry, B. D. Drain (*Tennessee Sta. Bul. 146 (1932), pp. 8, figs. 4*).—Supposedly a selfed seedling of Aroma, this promising new variety is described and discussed with respect to behavior at various locations in the State, shipping quality, disease resistance, runner formation, etc.

Vineyard soil management experiments, C. C. Wiggans (*Nebr. State Hort. Soc. Ann. Rpt., 62 (1931), pp. 18–23, 25*).—Of various cultural treatments studied with Concord grapes planted in 1923 by the Nebraska Experiment Station at its Union Fruit Farm, those including a mulch of straw proved least effective with respect to yield; in fact mulched plats yielded less than did those receiving cultivation alone. The addition of readily available forms of nitrogen had little or no effect on production of any treatment, but nitrate of soda did increase the growth of mulched vines by about 10 per cent. Scraping the soil proved as effective as tillage, and cover crops had no influence on yield.

On the cold resistance of the mulberry tree (preliminary note).—Relations between hardness of shoots and their cold resistance [trans. title], S. Ikeda (*Research Bul. Agr. Expt. Sta. So. Manchuria Ry. Co., No. 8 (1932), pp. 35–49, fig. 1; Eng. abs., pp. 47–49*).—A positive correlation was found between the hardness of mulberry shoots and the resistance of the trees to low temperature. With hardness of the lower part of the shoot taken as 100, those varieties the upper portions of whose shoots graded over 35 in hardness were found capable of enduring the cold winters of southern Manchuria.

The influence of carbon dioxide, oxygen, and rate of ventilation upon the storage, ripening, and respiration of bananas, F. Kidd and C. West ([*Gt. Brit.*] *Dept. Sci. and Indus. Research, Food Invest. Bd. Rpt. 1931, pp. 100–103, figs. 2*).—Observations on green Cavendish bananas placed in artificially ventilated glass containers showed that independent of the effects of carbon

dioxide or oxygen the rate of ventilation with air influenced ripening. Increases in carbon dioxide delayed ripening and in higher percentages were actually toxic. Where carbon dioxide was held below 0.2 per cent, increases in oxygen percentages above 5 per cent hastened maturity. Normal ripening did not take place at 2.5 and 0.1 per cent of oxygen.

Flower production from gladiolus corms harvested at different stages of ripening, B. E. Gilbert and F. R. Pember (*Plant Physiol., 7 (1932), No. 2, pp. 309–314*).—No essential differences in flower or corm yield were noted in this study by the Rhode Island Experiment Station, whether the plants were grown from early or late harvested corms, or whether the parent corms had their tops removed immediately after harvest or were allowed to dry before topping. There was some indication that Alice Tiplady corms which were allowed to mature in soil produced longer stalks and more florets per stalk.

Determinations of carbohydrate and nitrogen fractions in plants harvested at different dates showed an increase in storage forms of both carbohydrates and nitrogen as the season advanced, but in view of the fact that these changes had no marked difference on subsequent growth and flowering behavior the authors conclude that the differences as found were perhaps not great enough to influence the succeeding generation; in other words, the gladiolus corm has extensive reserves, greater than are actually needed to establish and maintain the new plants.

Growing Christmas holly on the farm, P. Coville (*U. S. Dept. Agr., Farmers' Bul. 1693 (1932), pp. II+22, figs. 10*).—Stating that of the 300 odd species of holly only the American (*Ilex opaca*) and the English (*I. aquifolium*) and its varieties have value for Christmas greens, the author describes the two types and discusses their botany, growth rates, soil preferences, propagation, culture, gathering, and marketing.

FORESTRY

[Forestry at the Michigan Station], R. H. Westveld (*Michigan Sta. Rpt. 1931, p. 281*).—Brief reports are presented on the relation of virgin stands of timber to soil conditions, and the control of weeds in forest seed beds by the use of zinc sulfate and burning over prior to germination.

[Forestry at the Mississippi Station], S. W. Greene (*Mississippi Sta. Rpt. 1932, p. 49*).—Information is presented upon the effect of annual burning of grass on the reproduction and growth of longleaf pine, and on the relation of such burning to the soil organic matter and nitrogen.

[Forestry at the Vermont Station] (*Vermont Sta. Bul. 344 (1932), p. 17*).—Data dealing with the movement of organic materials in the tree trunk and the causes for the uneven activity of the cambium, as shown by eccentric growth, and the effect of soil temperatures on the stem and root development of white pine are briefly discussed.

Germinative capacity of seed produced from young trees, D. S. Olson (*Jour. Forestry, 30 (1932), No. 7, p. 871*).—The earliest ages at which *Pinus monticola, P. ponderosa, P. contorta, Picea engelmanni, Larix occidentalis,* and *Thuja plicata* were observed to produce cones were 10, 14, 5, 16, 16, and 16 years, respectively. Although the seed yield per cone was less from younger trees, the viability appeared equal to that of older trees.

Growth and mortality of chestnut sprouts, R. M. Nelson (*Jour. Forestry, 30 (1932), No. 7, pp. 872, 873*).—Measurements of the sprouts from chestnut stumps located near Asheville, N. C., indicated that the removal of all but one sprout from each stump did not appreciably increase the growth of the remain-

ing sprout. However, of 100 sprouts observed in May, 1927, 88 per cent were dead in August, 1931.

Change in form of red spruce after logging and of northern white pine after thinning, C. E. Behre (*Jour. Forestry, 30 (1932), No. 7, pp. 805–810, fig. 1*).—Measurements taken by the U. S. D. A. Forest Service in a yellow birch-red spruce stand in northern New England in which selective cutting was made in the winter of 1924–25 showed that changes in form of trees left after logging depends upon the original character of the trees themselves. No significant changes occur in average form quotient unless the residual trees vary consistently above or below the general average at the time of cutting. The amount of variation in form quotients in residual trees decreases for a number of years after the partial cutting.

Bisexual flowers among the pines, F. I. Righter (*Jour. Forestry, 30 (1932). No. 7, p. 873, fig. 1*).—The occurrence is cited of bisexual flowers on the lateral shoots of 7-year-old *Pinus densiflora* and *P. massoniana* trees growing in the arboretum of the Institute of Forest Genetics at Placerville, Calif.

Pollination experiments with Scotch pine [trans. title], A. Dengler (*Ztschr. Forst u. Jagdw., 64 (1932), No. 9, pp. 513–555, figs. 8*).—Observing that in most years the several strains of Scotch pine growing at the Eberswalde Forestry School overlap in blooming sufficiently to allow ample opportunity for crossing, a study was made of the interrelationships of the strains and also their capacity for self-pollination. The Mark strain of Scotch pine was successfully pollinated by the French, Scotch, and Pfalz strains. However, the Mark and Pfalz strains responded more favorably to crossing than did either of the other two. Mountain pine, despite its foreign origin, displayed high fruitfulness. The various strains of Scotch pine were successfully self-pollinated.

Parthenocarpy was not observed in any of the strains of Scotch pine nor in mountain pine, and the nonfertilized cones abscised sooner or later. In crosses between jack pine and Scotch pine cones developed but generally with nonviable seeds. In crosses between the mountain pine and Scotch pine more fertile seeds were secured.

An example of white pine reproduction on burned lands in northeastern Pennsylvania, O. M. Wood (*Jour. Forestry, 30 (1932), No. 7, pp. 838–845, figs. 2*).—Observations on reproduction arising about a group of white pines towering above a thicket of young hardwoods in Sullivan County, Pa., showed reproduction to decrease fairly regularly in number with an increasing distance from the mother trees. The greatest number of seedlings occurred on the east strip and the smallest number on the west strip. The number of seedlings to establish themselves since 1915 have become progressively less, apparently due to changes in seed bed conditions. This situation is said to explain in part why white pine usually occurs in even aged stands.

Second-growth yield, stand, and volume tables for the western white pine type, I. T. Haig (*U. S. Dept. Agr., Tech. Bul. 323 (1932), p. 68, figs. 14*).—Stating that the western white pine is the most important species in large areas of rough uplands in northern Idaho and adjacent portions of Washington and Montana and that important forest industries have been founded on the white pine type, the author presents yield, stand, and volume tables to aid in determining the timber-producing capacity of second-growth stands to which the industry must shortly turn for raw material. The first part of the bulletin contains a discussion of the tables and their application, with methods of technic and original data used in the formation of the tables included in an appendix.

DISEASES OF PLANTS

Plant pathology (*Idaho Sta. Bul. 192 (1932), pp. 34–36*),—Progress reports are given of investigations on potato virus diseases, bean mosaic and curly top, grain smut control, curly top of tomatoes, bacterial wilt of alfalfa, and a sclerotium disease of wheat.

[Plant disease studies] (*Kentucky Sta. Rpt. 1931, pt. 1, pp. 19–22*).—Progress reports are given of investigations of virus diseases of tobacco and other plants, of angular leaf spot and wildfire of tobacco, of black root rot resistant strains of tobacco, and of frenching of tobacco.

Report of the section of botany, E. A. Bessey (*Michigan Sta. Rpt. 1931, pp. 247–250*).—Brief accounts are given of investigations by J. H. Muncie on cereal and potato diseases, the latter including a relatively new disease designated as the moron disease, and by R. P. Hibbard on the effect of ultraviolet light irradiation upon the basic metabolism of plants, on the influence of potassium and calcium deficiency on the transformation and utilization of carbohydrates and proteins in the pea, and on hollow heart in potatoes.

Annual report of the department of plant pathology, L. E. Miles (*Mississippi Sta. Rpt. 1932, pp. 41–43*).—Brief summaries of results are given of investigations on spraying and dusting for the control of pecan scab, cottonseed treatment with organic mercury compounds, Fusarium wilt, and a sweetpotato nematode disease.

Disease survey of the Giru district (*Queensland Agr. Jour., 32 (1929), No. 1, pp. 5, 6*).—A disease survey of the Giru district of Queensland was carried out in April, 1929, and the conditions are detailed as to plant diseases, varieties resistant or yielding thereto, their spread, and protective measures.

Macrophomina phaseoli (Maubl.) Ashby and Rhizoctonia bataticola (Taub.) Butl., J. C. Haigh (*Trop. Agr. [Ceylon], 73 (1929), No. 1, pp. 3, 4*).—Cultural and inoculation experiments are described, and some mutations are recorded. It is thought that some light may be thrown on the question of the parasitism in nature of *R. bataticola.*

Heterothallism and hybridization in Sphacelotheca sorghi and S. cruenta, H. A. Rodenhiser (*Jour. Agr. Research [U. S.], 45 (1932), No. 5, pp. 287–296, pls. 3, figs. 5*).—Studies by the author have shown that both species are heterothallic. Monosporidial lines failed to produce chlamydospores in the host plants, but when the plants were inoculated with two monosporidial lines of opposite sex, smutted heads were produced.

Monosporidial lines from both *S. sorghi* and *S. cruenta* were found to belong to two sex groups. In intraspecific and interspecific crosses these sex groups were found to be constant, and there was no evidence of complete intersterility or interfertility. Some evidence was obtained to indicate that the sexual compatibility of paired lines may be detected soon after the sorghum plants have been inoculated. On leaves of plants inoculated with sexually compatible paired lines distinct chlorotic areas developed in from four to six days after inoculation.

S. sorghi and *S. cruenta* were found to be interfertile. Intraspecific crosses produced sori in the panicles that were macroscopically characteristic of the species, while interspecific crosses produced sori macroscopically characteristic of *S. cruenta.* Sterile cells of both the elongated and the spherical types were found to be present in sori resulting from both intraspecific and interspecific crosses.

The fungicidal properties of certain spray-fluids, VI, VII, W. Goodwin, H. Martin, and E. S. Salmon (*Jour. Agr. Sci. [England], 20 (1930), Nos. 1, pp. 18–31; 3, pp. 489–497*).—This work continues that previously reported by these authors (E. S. R., 65, p. 537).

In part 6 the action of sulfur in its various forms was tested on the hop powdery mildew (*Sphaerotheca humuli*). When ground sulfur or flowers of sulfur was first wetted by a soft soap solution and sprayed onto the mildew patches the fungicidal action was complete in case of suspensions containing 5 g sulfur per 100 c c of 0.5 per cent soft soap solution; that is, previous to the settling of the sulfur particles in the spraying process. Gelatin or saponin substituted for soft soap as spreader gave striking differences in results. Such spreaders (acid in character) inhibited the fungicidal action, which was favored by alkaline spreaders besides soft soap, as lime casein and soda casein and dry-mix sulfur-lime. A completely fungicidal commercial colloidal sulfur also was found. The influence of the spreader upon the action of the colloidal sulfur was clearly shown. The possible influence is discussed of the spreader upon the hydrolysis of sulfur.

Experiments done in 1923 and noted in part 4 of this series (E. S. R., 57, p. 638; 65, p. 537), though admittedly too few to settle the exact percentage of polysulfide sulfur needed for complete fungicidal action, indicated the probable figure as near 0.1 per cent. Further tests were therefore made with solutions having sulfur in polysulfide form, as sodium, potassium, calcium, and barium polysulfides, applied to the conidial stage of *Sphaerotheca humuli* on young hop leaves in the greenhouse. This work is briefly outlined in part 7. The results confirm the view that the polysulfide sulfur content is a measure of the fungicidal power of spray fluids of the polysulfide class.

The hydrolysis of sulphur in relation to its fungicidal activity, H. Martin (*Jour. Agr. Sci. [England], 20 (1930), No. 1, pp. 32–44*).—The results have been given previously (E. S. R., 61, p. 545) of an investigation of the mechanism of the fungicidal action of sulfur "at a distance," and it appears to have been accepted that the initial stage of the fungicidal action of sulfur at a distance is the recondensation of the volatilized sulfur upon the fungus, where its action is essentially the same as that of sulfur applied directly to the leaf. The problem of the toxic action of sulfur at a distance is thus reduced to that of the mechanism of the toxic action of sulfur in direct contact with the fungus.

It is suggested as the result of the work here outlined that the fungicidal action of the sulfur upon the Erysiphaceae is due primarily to hydrolysis, and that the presence of alkali, which accelerates this hydrolysis, should enhance the fungicidal properties of sulfur. "An explanation is thus afforded of the inhibition of the fungicidal action of sulfur against the hop powdery mildew (*Sphaerotheca humuli*) by gelatin or saponin solutions when employed as the spreader and of the promotion of fungicidal action in the presence of soft soap and alkali casein solutions."

Attention is drawn to analogies between the action of sulfur upon the mildew and its action upon copper, and current views as to the fungicidal action of sulfur are discussed from the viewpoint of the hydrolysis hypothesis.

A phenol coefficient study involving bacterial plant pathogens, R. C. Thomas (*Ohio Sta. Tech. Bul. 10 (1932), p. 14*).—An investigation was carried on to determine the bactericidal efficiency of a number of disinfectants with respect to certain plant pathogens. A simple method is outlined for the determination of phenol coefficients of bactericides, using plant pathogens as test organisms. Using this method, phenol coefficient values were obtained for 14 different disinfectants with respect to 19 species of bacteria, including 13 plant pathogens and 6 animal pathogens.

The compounds which were found to possess the highest toxic efficiency for the organisms tested were metaphen, mercuric chloride, ethyl mercury chloride, and merthiolate, all of which are mercurial derivatives. Sulfur derivatives

manifested, in general, a greater toxic effect upon plant than upon animal pathogens.

The marked sensitivity of *Phytomonas pruni* to colloidal sulfur is believed to indicate that this form of sulfur would be of value for the control of the black spot disease of stone fruits.

Chlorosis (*Idaho Sta. Bul. 192 (1932), pp. 13, 14*).—A brief account is given of the results of investigations on chlorosis of trees, shrubs, and herbaceous plants.

Inheritance of resistance to bunt, Tilletia tritici, in hybrids of White Federation and Odessa wheat, F. N. Briggs (*Jour. Agr. Research [U. S.], 45 (1932), No. 8, pp. 501–505, fig. 1*).—This paper, from the California Experiment Station, deals with the inheritance of resistance to bunt in hybrids between susceptible White Federation and resistant Odessa. Additional data are given relating to a Martin-White Odessa cross (E. S. R., 62, p. 846).

A classification of the F_2 plants, based on the percentage of bunted plants in the F_3 rows, showed that Odessa differed from White Federation by one main dominant factor for resistance to bunt. This factor is considered identical with the factor for resistance in Martin, and the factor for resistance to bunt in White Odessa is identical with the factor in Martin.

Physiologic specialization in Puccinia graminis secalis, R. U. Cotter and M. N. Levine (*Jour. Agr. Research [U. S.], 45 (1932), No. 5, pp. 297–315, figs. 4*).—A report is given of a study made to ascertain the number, geographic distribution, and parasitic nature of the physiologic forms of *P. graminis secalis* on rye. During the period from 1921 to 1931, inclusive, about 150 collections of *P. graminis secalis* from the rye-growing sections of the United States and Canada and several European countries were studied to determine the physiologic specialization within this variety of rust.

Fourteen physiologic forms have been distinguished, and the characteristic parasitic behavior of each has been ascertained on several differential varieties of rye. Some of the physiologic forms identified were found to occur frequently and were widely distributed, whereas others occurred rarely and in restricted areas. The frequency of the occurrence of the different physiologic forms was not always coextensive with their distribution, nor was the prevalence of a given physiologic form paralleled by its virulence on the differential varieties.

The pathogenicity of the physiologic forms of *P. graminis secalis* was but slightly and only temporarily affected by external conditions, such as temperature and light. The authors state that there is strong circumstantial evidence of the occurrence of color mutations in the rye stem rust, but none so far of mutations in parasitic behavior. The possibility of the origin of rye stem rust forms through hybridization in the aecial stage is said to be supported by the evidence of the production of new forms of wheat stem rust by crossing *P. graminis secalis* with *P. graminis tritici.*

Australian rust studies, I–III, W. L. Waterhouse (*Linn. Soc. N. S. Wales, Proc., 54 (1929), pt. 5, pp. 615–680, pls. 4; 55 (1930), pts. 2, pp. 159–178, pl. 1; 5, pp. 596–636, pls. 3*).—In the first of these three papers, all of which deal with the outcome from work ending early in 1929, the cereal rusts which occur in Australia are dealt with, and results of investigations into their specialization and occurrence are recorded. These investigations followed the recognized methods of culturing the rusts on certain selected cereal varieties and determining the physiological forms from the rust reactions thus obtained.

Work with the aecidial stage of *Puccinia graminis* is said to have further disproved the old statement that stem rust of wheat in Australia has lost its

power of attacking barberry. Results obtained over a range of studies are detailed.

"Studies of the incidence of rust have shown that oversummering of the uredospore stage occurs in Australia. This applies to the stem rust of wheat and oats and to leaf rust of wheat."

In the second of these studies measurements were resorted to in the search for significant morphological differences between rust forms, and the findings are detailed and evaluated in connection with other characters.

In the third of these papers some initial results from breeding varieties for rust resistance are recorded. In this work a 75 per cent degree of success was obtained in the crossing of wheats. It was found that viable crossed grain could be obtained from heads on severed stalks kept in vessels of water in the plant house after pollination. Numerous wide crosses were attempted. Failure resulted from all efforts to cross wheat and barley, and complete sterility was found in a cross between wheat and rye. Results of other attempts are detailed with discussion.

It is concluded that despite the complexities inherent to the work, there would appear to be no valid reason why success should not be obtained in breeding fully resistant varieties which are also agronomically desirable. It is thought that in this work controlled plant house studies can be of the utmost assistance to the breeder.

Inheritance of smut resistance in hybrids of Early Gothland and Monarch oats, G. M. Reed (*Amer. Jour. Bot., 18 (1931), No. 9, pp. 803–815*).—It is stated that in comparing the results obtained with loose smut (*Ustilago avenae*) and covered smut (*U. levis*) on the hybrids between Early Gothland and Monarch, the most obvious fact is the absence of similarity in the behavior of the various F_3 progenies to loose and covered smut. These behaviors are described.

A progeny segregating to the loose smut may be resistant, segregating, or susceptible to the covered smut. Various other types of possible combinations have also been found. No progenies entirely susceptible to both smuts appeared. Facts and tendencies are discussed.

"Perhaps the most significant result is the fact that a few of the F_3 progenies are resistant to both loose and covered smut. It has been perfectly possible to combine resistance to both the smuts in new strains of oats. Further, this resistance to both smuts may be united in strains with either dark or light glumes. Probably any combination of resistance and various morphological characters could be secured."

Flag smut of wheat [and its control], J. H. Simmonds (*Queensland Agr. Jour., 30 (1928), No. 6, pp. 542–549, figs. 4*).—Wheat flag smut (*Urocystis tritici*), though present in Australia in 1868, has since appeared only twice in Queensland, in 1906 and 1915. The disease is described for recognition by growers, and comparative descriptions, to avoid confusion with other forms, are given of bunt or stinking smut and of loose or flying smut.

Recommendations stated to have been drawn up by the author (pp. 548, 549) include the use of disease-free seed, disinfection of the field with fire after harvesting, avoidance of feeding diseased material to stock, rotation, seed disinfection with copper carbonate or sulfate, late planting in a moist seed bed, and use of resistant varieties.

Rhizoctonia bottom rot and head rot of cabbage, F. L. Wellman (*Jour. Agr. Research [U. S.], 45 (1932), No. 8, pp. 461–469, figs. 2*).—Bottom rot and head rot of cabbage caused by *R. solani* are described. The former disease is said to occur every year, whereas the head rot is sporadic in its occurrence.

Both diseases were found to be caused by the strain of Rhizoctonia that produces damping-off or wire stem of cabbage seedlings (E. S. R., 53, p. 44).

A number of strains of *R. solani* were obtained and studied for evidence of physiologic specialization, and it appeared that strains of the organism were most pathogenic upon the hosts from which they were originally obtained. A relatively large amount of moisture was found necessary for optimum disease production by the fungus. Both types of the disease were produced at temperatures ranging from 9° to somewhat less than 32° C. The optimum temperature for disease development was found to be between 25 and 27°.

Cob rot of maize, R. B. Morwood (*Queensland Agr. Jour., 32 (1929), No. 4, pp. 393–397, pls. 3*).—Maize cob rot was reported from Australia in 1918 by G. P. Darnell-Smith as a serious and spreading disease, and recorded by Tryon (E. S. R., 45, p. 842; 56, p. 846) from southern Queensland in 1919 and in 1925 as throughout the Atherton Tableland, and later elsewhere. It may be produced by *Diplodia zeae* or *Fusarium moniliforme*, and may be controlled by burning all crop remains after harvesting, rotation, seed selection, and early cropping.

Fungi of flaxseed and of flax-sick soil, H. L. Bolley and T. F. Manns (*North Dakota Sta. Bul. 259 (1932), pp. 57, pls. 9, figs. 9*).—A report is given of studies made of the fungi of flaxseed and of flax-sick soils, much of the investigation having been conducted by Manns while connected with the station from 1901 to 1904. A preliminary account of the relation of *Fusarium lini* to flax wilt and flax-sick soils was published by Bolley in 1901 (E. S. R., 14, p. 55).

In addition to *F. lini, F. russianum, Colletotrichum lini, Alternaria* sp., and *Melampsora lini* were found to be associated with flax wilt and with flax-sick soils. *F. russianum* and *C. lini* are described as new species. *M. lini* is said to be the cause of flax rust.

The above species of root-destroying fungi were found present in all of the chief flax districts studied, and they are carried over in the soil from crop to crop, either as saprophytes, in or on the seed, and in or on the roots, stems, and other parts of the flax plant. The pathogenic nature of each of the parasitic types was demonstrated.

Flax plants grown from seed from many sources are said to indicate that *F. lini* is the most destructive and widely distributed parasite of flax, and that it is aided in producing flax sickness by *F. russianum, C. lini,* and *Alternaria* sp. Disinfection of flaxseed by formaldehyde was considered the most effective and satisfactory method of treatment.

The rapid spread of flax-sick soil condition, especially in light sandy loams known to be well adapted to flax growing, is discussed. In such situations long rotations and care in seed cleaning and grading, together with seed treatment, are recommended for the prevention of contamination of the soil. Immune or highly resistant strains of flax may also prove of benefit.

A sclerotial disease of Mucuna pruriens DC., L. S. Bertus (*Trop. Agr. [Ceylon], 73 (1929), No. 2, pp. 74–77, pl. 1*).—In diseased plants occurring in a plat of *M. pruriens* at the experiment station, Peradeniya, *Sclerotium rolfsii* was found. The results of its activity are described. Other plants are named as capable of being parasitized by this and other fungi named.

Fusarium wilt of peas with special reference to dissemination, K. J Kadow and L. K. Jones (*Washington Col. Sta. Bul. 272 (1932), pp. 30, pls. 4*).—According to the authors, *F. orthoceras pisi* is at the present time the cause of the most destructive disease of peas in Washington. No host specialization of the fungus has been demonstrated, although observations seem to indicate that

it exists. An organic mercury compound appeared to inhibit secondary invasions of other fungi, although it apparently played no part in checking infections by Fusarium wilt, and the treatment had no value in reducing wilt infection once the organism had become established in a field. Temperature and certain fungi of the soil seem to be the most important single factors directly influencing symptoms.

Fusarium wilt of peas is said to be seed borne. The combine harvester was found to play an important rôle in local dissemination of the fungus, as do other farm implements. The practice of feeding diseased vines to animals is discouraged, although preliminary tests did not show that the wilt spores remain viable after passage through their alimentary tracts. Dissemination by birds is not considered of much importance, although it may be possible. It is believed that dissemination of the wilt disease by wind may, under some conditions, be very important. At least one year is believed to be required after the wilt is introduced into a wilt-free field to result in the killing of the plants. The use of resistant varieties is considered to be the only practicable means of control after the disease becomes established in a field.

The insect vectors of the leaf-roll disease of the potato, P. A. Murphy and R. M'Kay (*Roy. Dublin Soc. Sci. Proc., n. ser., 19 (1929), No. 27, pp. 341–353*).—A review of the literature of potato leaf roll is given, with a list of carriers. *Myzus persicae* seems especially capable in this respect. Supposedly, *M. pseudosolani, Calocoris bipunctatus,* and *Macrosiphum solanifolii* also occasionally carry infection, but apparently insects other than aphids play no appreciable part in field infection. *Myzus persicae* is supposed to be a predominant factor in the distribution of leaf roll from and to sprouting tubers, young plants, or full-grown plants. Youth in the plants concerned favors quick development of the infection. Age in either plant renders infection more difficult. The symptoms following infection vary with the age of the inoculated plant. Infection of sprouts, young plants, plants of medium age, and older plants results, respectively, in secondary leaf roll, primary leaf roll passing into secondary, primary leaf roll persisting for the season, and no symptoms during the given season.

Plants infected early in the season give rise to a totally diseased crop next year. Tubers inoculated late in the season may escape infection totally or in part.

Cytological studies of potato plants affected with certain virus diseases, P. Clinch (*Roy. Dublin Soc. Sci. Proc., n. ser., 20 (1932), No. 15, pp. 143–172, pls. 5*).—This paper records microscopic study of potato plants affected with the virus diseases simple mosaic, interveinal mosaic, aucuba mosaic, crinkle, streak, and leaf roll. It is found that the extent of the modifications underlying the mottle effects in mosaic-infected leaves is proportional to the disease symptoms.

The forms of mosaic effects and the corresponding particular effects are detailed at some length. The fact that X-bodies are found in association with some virus diseases, but not with others, indicates their possible use in the classification of these diseases.

A critical review of some recent work on the occurrence of virus complexes in the potato, P. A. Murphy (*Roy. Dublin Soc. Sci. Proc., n. ser., 20 (1932), No. 18, pp. 193–210*).—The question has been raised as to the need for continuing the use of the terms crinkle, mosaic, and streak, since it is held that these diseases are complexes and that they do not indeed differ fundamentally from each other.

The common occurrence of viruses in the form of known or suspected complexes, as simple mosaic, crinkle, and streak, is emphasized, and the practical

importance of these complexes (diseases) is pointed out. The view that mosaic, crinkle, and streak are compounds of the same X and Y viruses, and therefore closely related, has not been established. Streak in Up-to-Date is usually accompanied by a simple mosaic. Alleged proof is presented that Up-to-Date streak is not a constituent of crinkle.

"The possible alteration of potato viruses on passage through tobacco is discussed. In so far as these changes take place, the resulting diseases do not correspond to local naturally occurring potato diseases, nor to combinations of them, or intermediates between them."

The compound nature of crinkle, and its production by means of a mixture of viruses, P. A. MURPHY and R. M'KAY (*Roy. Dublin Soc. Sci. Proc., n. ser., 20 (1932), No. 20, pp. 227–247, pls. 3*).—"It is shown below that one of the original diseases, namely, crinkle, is not a single disease but a compound of simple mosaic and another apparently undescribed virus disease, which for the sake of convenience is provisionally termed 'disease A' below. The corresponding virus is also designated 'virus A' until its constitution and relationships have been more exactly determined."

It is stated that experimentation repeated three times at different periods introducing virus A into Irish Chieftain potato carrying another virus gave a disease indistinguishable from crinkle. This disease transferred to President again reproduced crinkle in most cases, though in others a mild mosaic alone resulted from loss of one of the constituents in transmission. In still others a disease intermediate between crinkle and simple mosaic resulted, the interpretation of which is discussed.

A constituent is also sometimes dropped in the graft transmission of naturally occurring crinkle. Kerr Pink, like others, can be systematically infected with this disease, though it afterwards recovers, filtering out one constituent and leaving a mild mosaic.

When, in two separate experiments, virus A was introduced into healthy President, and later simple mosaic was inoculated in the same plant, typical and persistent crinkle symptoms developed in most cases, and faint mosaic in others. The synthetic crinkle produced as described above caused the same typical necrotic disease as naturally occurring crinkle in Up-to-Date. A combination of interveinal mosaic and virus A produced an aberrant form of crinkle. It is claimed that the production of a crinkle-like disease when virus A was combined with streak from Up-to-Date was due to a simple mosaic occurring as an impurity along with the streak, this streak having no part in the constitution of crinkle. The existence of varieties of crinkle is thought probable.

Some of the characteristics of the A disease are described, and its practical importance is discussed.

Virus diseases of potatoes (*Nature [London], 130 (1932), No. 3271, p. 64*).—This brief note mentions the three studies on plant virus diseases financed by the Empire Marketing Board which are noted above.

Studies on the bacterial wilt of the Solanaceae in Porto Rico, J. A. B. NOLLA (*Jour. Dept. Agr. Puerto Rico, 15 (1931), No. 3, pp. 287–308, pls. 4*).—Bacterial disease of solanaceous vegetable crops prevalent in Puerto Rico for many years is said to affect tomatoes, potatoes, eggplant, and pepper regularly; *Solanum torvum*, *S. nigrum*, and zinnias occasionally; and tobacco not at all. The pathogene is thought to be culturally identical with *Phytomonas solanacearum*. It may be disseminated by the green beetle, *Diabrotica graminea*, and may harbor in plant remains for at least 10 years.

A leafspot disease of Andropogon sorghum caused by Cercospora sorghi E. & E., T. S. RAMAKRISHNAN (*India Dept. Agr. Mem., Bot. Ser., 18 (1931)*),

No. 9, pp. 259–277, pls. 4, figs. 6).—In and near Coimbatore *A. sorghum* of several varieties has been affected with a leaf spot due to *C. sorghi*, which did not infect maize in this locality though said to do so elsewhere. Characters and behavior of the organism are described as noted locally.

Cane diseases, A. F. Bell (*Queensland Agr. Jour., 30 (1928), No. 3, pp. 188–190*).—In 1926, a field officer of the Bureau of Sugar Experiment Stations reported the presence of Fiji disease on several farms in the Beenleigh district, this being the bureau's first record of the establishment of this disease in Queensland. Periodic visits later have recorded a marked improvement in the Fiji disease situation, though it is said to be still the most common cane disease and the most costly in that district. Mosaic serious damage is confined to the eastern end of Eagleby. Gumming disease is present in the same district.

Downy mildew or "leaf stripe" disease of sugarcane (*Queensland Agr. Jour., 32 (1929), No. 1, pp. 4, 5*).—In this report it is stated that the downy mildew or leaf stripe of sugarcane exists in most parts of north Queensland growing susceptible varieties. Though the exact point of origin is not known, it has been present in Queensland and Fiji for many years. In 1909 it was found in Taiwan (Formosa), Japan; in 1920 it was introduced into the Philippines from Taiwan, but prompt measures were taken and the disease was quickly eradicated.

The disease is said to be particularly destructive to the variety B. 208 in the Lower Burdekin and B. 147 and Pompey in the Mossman district.

Behavior of mosaic in certain sugarcane varieties in Louisiana, E. C. Tims and C. W. Edgerton (*Amer. Jour. Bot., 18 (1931), No. 8, pp. 649–657*).—In a study of sugarcane varieties showing degrees of resistance to the mosaic disease, it was found that certain of the old varieties, as D. 74 and Louisiana Purple, do not to any great extent recover from the disease, though in these varieties it has been possible gradually to select strains which show the mosaic symptoms in only the mildest form. The P. O. J. canes, which are hybrids between old standard varieties and wild immune canes, are not immune to the mosaic disease. Of the four varieties which have been studied in Louisiana, P. O. J. 36 and P. O. J. 234 are quite susceptible, while P. O. J. 213 and P. O. J. 228 are classed as resistant. The relative resistance of these varieties is largely due to the ability of the plants to throw off the disease and to produce buds free from the virus. Infected stalks of these varieties, when planted, may produce both healthy and diseased shoots. The resistant varieties, P. O. J. 213 and P. O. J. 228, produce more healthy shoots than the susceptible varieties, and this accounts for the relatively low infection in the field.

The disappearance of mosaic symptoms on the P. O. J. canes also commonly occurs in the field, many plants showing the disease in early summer appearing healthy in the fall. This is also more common with P. O. J. 213 and P. O. J. 228 than with P. O. J. 36 and P. O. J. 234.

Spoilage of tomatoes in transit, as shown by inspection certificates, 1922 to 1930, N. E. Stevens and N. W. Nance (*U. S. Dept. Agr. Circ. 245 (1932), pp. 4*).—As a result of a study of tomato inspection certificates more than a dozen forms of rot are recognized. Of these, those caused by *Rhizopus nigricans, Phoma destructiva, Bacillus carotovorus*, and *B. aroideae, Corticium vagum*, and *Phytophthora terrestria*, as well as blossom-end rot which is considered nonparasitic, are among the more important. The yearly losses in inspected shipments from five States and Mexico show that Rhizopus is the most important single cause of decay of tomatoes, with the Phoma rot second and the bacterial soft rots third.

During the period under consideration there appears to have been an apparent decline in the total amount of decay, although this was not marked.

Further observations and experiments with mosaic diseases of raspberries, blackberries, and dewberries, C. W. BENNETT (*Michigan Sta. Tech. Bul. 125 (1932), pp. 32, figs. 6*).—Two general types of mosaic on raspberries, blackberries, and dewberries are recognized in Michigan, a yellow mosaic which requires a high temperature maximum for symptom expression and produces distinct yellowing with little or no necrosis, and a second type which is characterized by a low temperature maximum for symptom expression, by mottling, and by necrosis of the leaf petioles and cane tips. This form is said to vary in severity from a very mild mottling on the first leaves produced in the spring to a type which causes severe necrosis, accompanied by rosetting and resulting in the death of black raspberry plants in a few years. This latter form is discussed as red raspberry mosaic. Both the yellow and red raspberry mosaic were found to occur in combination.

The viruses of these two mosaics are said to differ in their rate of dispersion in the plant. The virus of yellow mosaic occurs in the inoculated cane during the season of infection, but in most instances does not move into all parts of other canes of the hill until the spring following infection. Red raspberry mosaic virus was found to move to all parts of the inoculated plant during the first season. On experimental plants the virus of red raspberry mosaic moved downward from the tips of first year canes of the black raspberry at a rate of approximately 0.2 in. per hour. Neither virus was found to move through a portion of the stem from which a ring of bark had been removed.

The chief agent of mosaic dissemination is considered to be *Amphorophora rubi*, although plants inoculated with red raspberry mosaic by means of *A. rubicola* and others inoculated by means of *A. sensoriata* became infected. The latter two species are considered vectors of red raspberry mosaic but rank in importance below *A. rubi*. Varieties of raspberries, blackberries, and dewberries were found to vary in their ability to support populations of *A. rubi*. Latham, King, and St. Regis were favorable hosts, while Cuthbert, Cumberland, Plum Farmer, and Eldorado blackberry and Lucretia dewberry were less favorable. The aphids spread the virus rapidly from Latham and King to adjacent black varieties.

A. rubi is said to have acquired the virus of yellow mosaic in a feeding time of 2 hours and transmitted it to healthy plants during the following 48-hour period. It acquired the virus of red raspberry mosaic in 12 hours and transmitted it to healthy plants during the following 12-hour period. Aphids subjected to short-interval transfers on healthy plants lost the virus of red raspberry mosaic, and it is thought that this may also apply to the virus of yellow mosaic. Aphids of all stages of development were capable of acting as vectors of both types of mosaic.

Grape mildew in relation to precipitation in Tunisia [trans. title], C. CHABROLIN (*Dir. Gén. Agr., Com. et Colon. [Tunis], Bul., 35 (1931), No. 146, pp. 235–256*).—Examination of the records of precipitation during the period 1900–1930 for the grape-growing region lying between Tunis and Grombalia and of the history of grape mildew outbreaks during that period is said to show for precipitation a rôle which is secondary (8 years of 30) to negligible (20 years of 30), though in 2 years of 30 rainfall was connected with a really disastrous disease outbreak.

The development of mildew seems to depend closely upon the distribution of rainfall during the months of March, April, May, and June. Detailed directions are given for the use of protectives, particularly during that period.

Diseases of the banana in Queensland, J. H. Simmonds (*Queensland Agr. Jour., 30 (1928), No. 5, pp. 438–454, figs. 9*).—Descriptions for growers are given of banana bunchy top, leaf spot, Panama disease, dry rot, and the fruit troubles stem-end rot, anthracnose, cigar end, and squirter.

Leaf spot of banana in southern Queensland, B. T. Dickson (*Queensland Agr. Jour., 30 (1928), No. 5, pp. 455–457*).—As the result of a survey in June and July, 1928, the author reports on the situation regarding banana leaf spot, suggesting investigations in six phases which are indicated.

[Disease] studies on cacao, R. Ciferri (*Jour. Dept. Agr. Puerto Rico, 15 (1931), No. 3, pp. 223–250*).—In this part of the author's account of studies on cacao, he deals with the identification and relations of the mold-causing forms, moisture contents, and the course and effects of molding or its prevention in cacao.

Comparison of tobacco dust with other forms of nicotine in control of yellow spot disease of pineapples, W. Carter (*Jour. Econ. Ent., 25 (1932), No. 5, pp. 1031–1035*).—In tests of tobacco dust and seven other nicotine forms by the Hawaiian Pineapple Canners' Experiment Station as a control measure against yellow spot, the distribution of plats was such as to offset the irregular incidence of yellow spot which naturally occurs.

"The results of this experiment clearly indicate the superiority of tobacco dust over the other nicotine applications. Incidence of the disease was conditioned by growth and succulence of the plant, the infestation being lower in the poorly growing areas of the field. The reduced infestation in tobacco dusted plats is believed due to the changes induced in the plant as a result of the dust application; agronomic variations between areas may offset or accentuate this effect."

On the so-called sooty molds of tea [trans. title], K. B. Boedijn (Boedyn) and A. Steinmann (*Arch. Theecult. Nederland. Indië, No. 1 (1931), pp. 25–57. pls. 9, fig. 1; Eng. abs., pp. 45–48*).—The authors distinguish between the real sooty molds that live on the exudations of chiefly leaf-frequenting insects, as *Capnodium theae, Chaetothyrium javanicum, Phycopsis treubii,* Triposporium, and an Antennularia, and those that live on the insects themselves, as *Septobasidium theae* and *S. curtisii.* Discussion is given of these, their habits, and their control.

A preliminary note on a disease of young rubber buddings, R. K. S. Murray (*Trop. Agr. [Ceylon], 73 (1929), No. 4, pp. 238, 239*).—In bud-grafted Hevea, shoots showing each a discolored sunken area about 6 in. long on one side bore fructifications of *Gloeosporium alborubrum,* and cultures yielded this organism. *Phytophthora* sp. was also borne, and inoculations established this fungus as the cause of the disease. It is not yet known whether this fungus, not yet specifically identified, will prove to be a serious retarding factor. It proves to be another wet-weather disease. Inoculations show seedlings also to be susceptible.

On the occurrence and significance of Oidium leaf disease in Ceylon, R. K. S. Murray (*Trop. Agr. [Ceylon], 73 (1929), No. 2, pp. 92–107, pl. 1*).—The Oidium leaf disease of Hevea in Ceylon is regarded more seriously by the author than generally in that area as the disease has in certain districts already become a serious menace to the existence of rubber in portions of the island.

Note on brown bast treatment, J. Mitchell (*Trop. Agr. [Ceylon], 73 (1929), No. 1, p. 10, pl. 1*).—Evidence is said to have been reported recently corroborative of the view that the exposed part of the newly tapped rubber-

tree bark is no more susceptible to brown bast than is bark in the normal condition.

Rose anthracnose caused by Sphaceloma, A. E. JENKINS (*Jour Agr. Research [U. S.], 45 (1932), No. 6, pp. 321–337, pls. 7, figs. 6*).—A description is given of rose anthracnose, a disease of wide distribution throughout the world that has been generally confused with other rose diseases and not recognized as distinct.

The pathogen, originally described by Passerini as *Phyllosticta rosarum*, is transferred to the genus Sphaceloma and recorded as *S. rosarum* n. comb. The morphological and cultural characteristics of the fungus are described, and evidence is presented to show that it is the cause of the disease.

The available information for the control of anthracnose is summarized. Experience has shown that it can be controlled by spraying with Bordeaux mixture or by applications of lime-sulfur before the leaf buds open, followed by Bordeaux mixture after the leaves are developed.

Environment and disease: A discussion on the parasitism of Armillaria mellea Vahl. Fr., W. R. DAY (*Forestry, 3 (1929), No. 2, pp. 94–103*).—This is a discussion of the parasitism of *A. mellea*, dealing with the predisposing factors and types of environment, the parasite and its environment, the habitat of the fungus, the parasitism of *A. mellea*, the fungus as a factor in the disease, the condition of the soil, the silvicultural state of the forest, and variation in susceptibility to *A. mellea*.

A. mellea is supposed to be a factor secondary to some primary factor. Predisposing factors for *A. mellea* include soil conditions acting alone or in conjunction with others, such as defoliating larvae or mildew infection, which may even themselves predispose the tree to abnormal developments.

A bacterial disease of the tung-oil tree, L. MCCULLOCH and J. B. DEMAREE (*Jour. Agr. Research [U. S.], 45 (1932), No. 6, pp. 339–346, figs. 3*).—A bacterial leaf spot of the tung-oil or wood-oil tree (*Aleurites fordi*) is described.

The disease, which has been reported only from Georgia, is said to produce brown, angular spots on the leaves, and defoliation results when considerable leaf tissue is affected. Moisture and heat are considered favorable for its occurrence and spread. The bacteria are believed to remain alive and infectious in the lesions of fallen leaves in the orchards until new leaves appear the following spring. Such leaves are considered to be a factor in the recurrence of the disease. The causal bacteria were isolated and used to produce typical lesions on tung-oil leaves. The bacteria were found to be only slightly infectious on leaves of the castor-bean, while on several varieties of garden beans the infections due to these bacteria were very severe.

A description is given of the morphologic, cultural, and physiologic characters of the pathogen, for which the name *Bacterium aleuritidis* is proposed.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Game laws for the season 1932–33: A summary of Federal, State, and Provincial statutes, H. P. SHELDON and F. G. GRIMES (*U. S. Dept. Agr., Misc. Pub. 151 (1932), pp. 34*).—This is the annual summary of the Federal and other game laws and regulations (E. S. R., 66, p. 153).

Key-catalogue of parasites reported for Insectivora (moles, shrews, etc.), with their possible public health importance, C. W. STILES and S. F. STANLEY (*U. S. Pub. Health Serv., Natl. Inst. Health Bul. 159 (1931), pp. IV+791–911*).—This bulletin represents part 7 of the host catalogue of parasites (E. S. R., 65, p. 650).

Agricultural pests and plant diseases observed in Yorkshire during 1931, W. E. Collinge (*Yorkshire Agr. Soc. Trans., 89 (1931), pp. 43–54*).—Animals injurious to farm and garden produce, fruit trees, and forest and ornamental trees, animal parasites, etc., are briefly reported upon.

[Notes on economic insects and their control] (*Jour. Econ. Ent., 25 (1932), No. 5, pp. 1107–1113, fig. 1*).—The contributions here presented (E. S. R., 68, p. 215) are as follows: Box Elder Bug on Strawberries, by R. Hutson (p. 1107); Hawaiian Parasite [(*Aphycus*) *Pseudococcobius terryi* Fullaway] of Sugarcane Mealybug [*Pseudococcus boninsis* Kuwana] Sent to Louisiana, by T. E. Holloway (p. 1107); A Cage for Clothes Moth [Webbing Clothes Moth] Larvae, by W. Colman (p. 1108); The California Tortoise Shell Butterfly, *Aglais californica* (Bdv.), by E. O. Essig (p. 1108); An Experimental Corn Duster, by E. R. Van Leeuwen (pp. 1108–1110); The Natural Protection of Gladiolus Cormels from Thrips' [*Taeniothrips gladioli* M. & S.] Attack, by F. F. Smith (p. 1110); A Hitherto Unreported Curculionid Pest of Onion and Garlic in Texas [*Ceutorhynchus tau* Lec.], by C. E. Smith (pp. 1110, 1111); Notes on a New Parasite of the Codling Moth [*Calliephialtes nucicola* Cush.] by R. E. Barrett (pp. 1111, 1112); and Observations on the Association of Thrips [Onion Thrips] with Arsenical Injury on Snap Beans, by L. W. Brannon (pp. 1112, 1113).

[Report of work in entomology] (*Idaho Sta. Bul. 192 (1932), pp. 30, 31*).—This brief report (E. S. R., 66, p. 243) considers work with the tarnished plant bug, codling moth, leafhoppers, Colorado potato beetle, western cooperative oil spray project, destructive prune worm, and cattle lice.

[Report of work in entomology], R. H. Pettit (*Michigan Sta. Rpt. 1931, pp. 253–273, figs. 17*).—This report on work in entomology (E. S. R., 66, p. 153) refers particularly to observations on the oriental fruit moth, cherry maggot and black cherry fruit fly, pistol case bearer, fruit tree leaf roller, cherry case bearer (*Coleophora pruniella*), raspberry mite (*Tetranychus mcdanieli* McG. and *Paratetranychus ilicis* McG.), silver leaf mite of peach (*Phyllocoptes cornutus*), raspberry sawfly, blackberry leaf miner (*Metallus rubi*), *Badebecia urticana*, pea moth, seed-corn maggot, onion maggot, carrot rust fly, climbing cutworms, nose fly of deer (*Cephenomyia probifer*), spruce tortrix (*Argyroploce abietana*), larch case bearer, and Lecanium (*L. numismaticum*) on jack pine and Scotch pine, including notes on their occurrence during the year.

Annual report of department of zoology and entomology, C. Lyle (*Mississippi Sta. Rpt. 1932, pp. 28–32*).—Brief reference is made to the progress of work (E. S. R., 66, p. 754) with scale insects, by L. E. Myers et al.; pecan insects, by J. M. Langston; and cotton aphid and cotton leaf bugs, by A. L. Hamner.

The coaptations in insects [trans. title], J. Corset (*Bul. Biol. France et Belg., 1931, Sup. 13, pp. 337, pls. 2, figs. 182*).—In the introduction to this treatise the author defines coaptation in the words of L. Cuénot[2] as a reciprocal adjustment of two independent parts of an animal organism which perform, as the result of their union, a definite function. The first of the four chapters (pp. 4–236) takes up the morphology of coaptations as exhibited among the various groups of insects; chapter 2 is devoted to the physiological side of the subject (pp. 237–288), chapter 3 to the biology (pp. 289–307), and chapter 4 to a philosophical study of the subject (pp. 308–325). A five-page list of references to the subject is included.

[2] Sci. Mod., 3 (1926), No. 1, pp. 39–48, figs. 19.

The proboscis response of insects, with special reference to blowflies, C. E. Abbott (*Ann. Ent. Soc. Amer., 25 (1932), No. 1, pp. 241–244*).—The author concludes that "the proboscis response is a characteristic reaction of insects with extensible sucking mouth parts. This response is initiated by one or more stimuli, the more important of which are chemical. The preception of chemicals is olfactory. In Diptera the nervous mechanism of this response is complete in the head, but this does not preclude the possibility that the sensory part of the mechanism exists elsewhere. The sensory elements involved are not exclusively antennal."

Some problems encountered in the estimation of insect populations by the sweeping method, D. M. DeLong (*Ann. Ent. Soc. Amer., 25 (1932), No. 1, pp. 13–17*).—The author, who has been engaged in comparative insect population studies upon certain truck and field crops for the past few years, here considers the more obvious and important factors which cause variation in the numbers caught.

Upsetting the balance of nature, with special reference to Kansas and the Great Plains, R. C. Smith (*Science, 75 (1932), No. 1956, pp. 649–654*).—The subject is here considered under the headings of the growing of wheat and its effect on some grass-feeding insects, some native prairie insects become pests of cultivated corn, some native prairie forms which attack alfalfa, and some miscellaneous examples of changed food habits or host relations.

Winter temperature gradients as a factor in insect survival, G. A. Mail (*Jour. Econ. Ent., 25 (1932), No. 5, pp. 1049–1053, fig. 1*).—In this contribution from the Montana Experiment Station data are presented to show the small fluctuation of soil surface temperatures under a snow covering compared with air temperatures.

The relation of respiratory metabolism of insects to their susceptibility to fumigants, R. T. Cotton (*Jour. Econ. Ent., 25 (1932), No. 5, pp. 1088–1103, figs. 6*).—It is pointed out that "the susceptibility of an insect to a fumigant varies with the rate of respiratory metabolism. Certain factors increase the rate of metabolism; others decrease it and automatically increase or decrease the susceptibility of the insect. Of the known factors that increase the susceptibility of the insect to a fumigant, the three most important are an increase in temperature, an increase in the carbon dioxide content of the fumigation chamber, and a decrease in the oxygen content of the fumigation chamber."

Some remarks on the physiological action of oil sprays, A. L. Strand (*Jour. Econ. Ent., 25 (1932), No. 5, pp. 991–994*).—A discussion of the probable trend of work on the physiological action of oil sprays, with emphasis on the study of the oxidation-reduction systems in plant and animal tissue, contributed from the Montana Experiment Station.

Water-soluble arsenic in oil emulsion-lead arsenate combination sprays, R. H. Robinson (*Jour. Econ. Ent., 25 (1932), No. 5, pp. 995–1001*).—Laboratory studies of oil emulsion-lead arsenate combination sprays with distilled water as a diluent at the Oregon Experiment Station reveal that "excessive amounts of water-soluble arsenic are liberated by chemical reaction. When alkaline spray waters are used in preparing the mixture, the amount of water-soluble arsenic is increased materially and one water showed as high as 25 per cent of the total arsenic of the lead arsenate had changed to the soluble form. In order to prevent as much as possible severe foliage injury, the use of hydrated lime is recommended to reprecipitate the soluble arsenic as basic calcium arsenic. A half pound of lime is suggested for each 100 gal. of the combination spray."

The effects of oil spray on the navel orange, D. D. Penny (*Jour. Econ. Ent., 25 (1932), No. 5, pp. 1002–1007*).—The author reports that a "navel orange

grove at Charter Oak, Calif., which now has a record of nine years of oil spraying, shows a normal increased yield with generally excellent vegetative condition. As compared with nine fumigated check trees, the sprayed trees show more vegetative stimulation and more complete scale control. Severe infestations of black scale present when treatments started have been reduced greatly, and subsequent spray treatments have kept this pest and red spider under satisfactory control."

Tank mixture spray, R. H. Smith (*Calif. Citrogr., 17 (1932), No. 9, pp. 346, 362*).—This contribution from the California Citrus Experiment Station is a practical summary of information based upon the work reported in a bulletin previously noted (E. S. R., 67, p. 563).

The vapor-heat treatment as applied to the control of narcissus pests, R. Latta (*Jour. Econ. Ent., 25 (1932), No. 5, pp. 1020–1026, pl. 1, fig. 1*).—The vapor-heat method has been found adaptable for the treatment of narcissus bulbs for the control of bulb flies and mites. A two-hour period of treatment at 111° F. appears to be the minimum requirement for control of the larvae of the lesser bulb flies (*Eumerus* spp.) and of the narcissus bulb fly. Control is also obtained of the two species of mites, the bulb mite and *Tarsonemus approximatus narcissi* Ewing, which are frequently found on narcissus. Bulbs treated at the optimum time during the dormant period were forced under glass and produced good flowers. Planting stock so treated is benefited through the more vigorous growth caused thereby and an additional increase in weight in the resultant crop.

Insects found on pea fields in the Willamette Valley, Oregon, after harvest, A. O. Larson and F. G. Hinman (*Jour. Econ. Ent., 25 (1932), No. 5, pp. 971–976*).—The average number of insects on pea fields after harvest in the Willamette Valley of Oregon was found to decrease each day after harvest. Of the total number of insects other than pea weevils, 76 per cent were injurious, 22 per cent were beneficial, and 2 per cent were of unknown economic importance.

An inquiry into the stability and restriction of feeding habits of certain cactus insects, J. C. Hamlin (*Ann. Ent. Soc. Amer., 25 (1932), No. 1, pp. 89–120, figs. 3*).—The author here reports upon eight species of North American cactus-feeding insects that have been studied as regards the safety to Australian agricultural interests if imported to combat naturalized opuntias.

The evaluation of stomach poisons for grasshopper baits, C. H. Richardson and L. E. Haas (*Jour. Econ. Ent., 25 (1932), No. 5, pp. 1078–1088, fig. 1*).—In experimental work at the Iowa Experiment Station, adults of the red-legged grasshopper and the differential grasshopper were fed "determined quantities of bran, molasses, and water bait, which contained known concentrations of arsenious oxide, monosodium arsenite in solution, trisodium arsenite in solution, Paris green, acid lead arsenate, sodium fluosilicate, or rotenone. The method is described. The estimated median lethal dose (m. l. d.) of arsenious oxide is 0.36 mg per gram of body weight. For the sodium arsenites, Paris green, and sodium fluosilicate, the m. l. ds. are approximately equal and estimated to be about 0.16 mg/gram. The m. l. d. for acid lead arsenate is >3.0 mg/gram, and for rotenone probably >2.0 mg/gram. For survival periods less than 96 hours, monosodium arsenate was more toxic than the other compounds. Under experimental conditions, the grasshoppers were not repelled by the odor or taste of the bait mixtures used and ceased to feed only when they became satiated or were too sick to eat more. If undisturbed, they usually consumed a toxic dose of an active poison before leaving the bait."

Some effects of certain toxic gases on the blood of the cockroach Periplaneta orientalis (Linn.), W. E. Shull, M. K. Riley, and C. H. Richardson (*Jour. Econ. Ent., 25 (1932), No. 5, pp. 1070–1072*).—In studies conducted only a few of the toxic gases used produced a visible effect upon the process of blood coagulation or upon the blood cells of the oriental cockroach, or brought about readily visible chemical changes in its blood.

"Roaches which were killed with carbon disulfide yielded a small quantity of blood poor in cells; those killed with pyridine also yielded little blood but the cell content was apparently normal. The blood of roaches which were killed with acetic vapor did not coagulate, and the cells were fixed in an apparently normal condition. Crystals of magnesium ammonium phosphate appeared in the blood of the roaches which succumbed to ammonia gas. As these were the only effects observed in the blood of roaches treated with 34 inorganic and organic compounds of widely differing physical properties and chemical composition, it is probable that lethal concentrations of most gaseous compounds do not produce marked visible changes in the blood of this insect."

Liothrips vaneeckei Priesner, a recently discovered pest of lily bulbs, R. Schopp and C. F. Doucette (*Jour. Econ. Ent., 25 (1932), No. 5, pp. 1016–1019*).—The thrips species *L. vaneeckei*, first described in 1920 from specimens collected in the Netherlands in 1915, was found in lily bulbs in the Pacific Northwest in 1930 and 1931, which led to the investigation here reported upon. This species, which is widespread in Europe and occurs in Japan, Ceylon, and Canada, is now known to be present in the United States in California, New York, North Carolina, Oregon, and Washington. Native bulbs of *Lilium washingtonianum* of considerable age growing in an isolated section of the Santiam National Forest, Oreg., were found infested by it, and in cultivated plantings a decided preference for this species of lily has been shown. Brief notes on the several stages of the insect are given.

The resistance of certain red clovers and alfalfas to leafhopper injury, H. H. Jewett (*Kentucky Sta. Bul. 329 (1932), pp. 155–172, figs. 3*).—In a study conducted during the seasons of 1929 to 1931, inclusive, in which clovers and alfalfas grown from seed from different localities were tested as to their resistance to potato leafhopper injury, certain varieties of clover were determined to be more resistant than others to such attack. Their relative resistances to injury were compared with that of Kentucky red clover, the details of which are presented in large part in tabular form.

The Kentucky red clover was found least affected by hopper injury, and, in general, the French and Italian clovers showed the greatest amount of injury. The alfalfas Ontario variegated, Kansas common, and North Dakota common, used in the tests in 1929, had about equal amounts of losses from hopper injury. Of the four Kansas common alfalfas and an Ontario variegated alfalfa used in 1930, the "Kansas common 3" had the greatest loss from hopper injury.

A comparison of the amounts of losses from hopper injury sustained by certain of the clovers used in the experiments in 1931 with the amounts of pubescence of those clovers makes it appear that there is no very direct correlation between the amount of injury and the amount of pubescence, and that some other undetermined factor or factors have an important function in helping resist hopper injury.

Six new aphids from Colorado, C. P. Gillette and M. A. Palmer (*Ann Ent. Soc. Amer., 25 (1932), No. 1, pp. 136–151, pls. 2*).—In this contribution from the Colorado Experiment Station a genus is erected (Pseudoepameibaphis) and new species are described as follows: *Toxoptera viridi-rubra, Rhopalosiphum scirpifolii, Aphis argentinae-radicis, A. pilosicauda, A. pseudovalerianae*, and *P. glauca.*

Border plantings as guard rows in pineapple mealy bug control, W. Carter (*Jour. Econ. Ent., 25 (1932), No. 5, pp. 1027–1030, pls. 3*).—This contribution from the Hawaiian Pineapple Canners' Experiment Station reports that the planting of several beds of pineapple plants in a strip parallel to the edge of fields and separated from the main plantation by a road is proving essential to economical spraying against the pineapple mealybug. These borders serve as guard rows against too rapid a movement of mealybugs into the field and at the same time localize the area to be regularly sprayed.

The cottony cushion-scale in Puerto Rico, M. D. Leonard (*Jour. Econ. Ent., 25 (1932), No. 5, pp. 1103–1107*).—This contribution from the Puerto Rico Insular Experiment Station records the discovery, spread, and initiation of control measures for the cottony-cushion scale in Puerto Rico. Its food plants are listed and natural enemies discussed, including the introduction and colonization of the vedalia or Australian lady beetle.

Experiments with toxic substances in spray oils in controlling red scale, R. H. Smith (*Calif. Citrogr., 14 (1929), No. 8, pp. 315, 326*).—An account is given of preliminary work at the California Citrus Experiment Station aimed at increasing the insecticidal efficiency of the light oils in order to make them more effective against the California red scale. In search for an intermediate solvent between nicotine and oil a few were found to be efficacious, including butanol (normal butyl alcohol), isopropyl alcohol, oleic acid, and pine oil. Many tests were made in the effort to discover a method of permanently fixing the nicotine in the oil, but without success. The author is led to conclude that there is little use of making further empirical tests in attempting to increase the killing efficiency of spray oils with toxic substances until more information is obtained concerning the way the red scale is killed by oil spray.

Experiments with toxic substances in highly-refined spray oils, R. H. Smith (*Jour. Econ. Ent., 25 (1932), No. 5, pp. 988–990*).—In continuation of the work above noted, the author reports upon laboratory experiments conducted largely with lemons infested with the California red scale.

Kerosene and mineral seal types of oils chiefly were used as carriers for the substances tested, the oils ranging from 32 to 55 seconds viscosity (Saybolt at 100° F.) and from 95 to 98 per cent unsulfonated residue. The spray was applied in the form of a mechanical mixture of oil and water. The results obtained were checked by orchard tests, using light-medium and medium spray oils as carriers for the toxicants. Many substances were tested in this way, various intermediate solvents having been employed to increase the solubility of the toxicants in the oils. Butanol was found to be an effective intermediate solvent for 95 per cent nicotine and spray oils, and butyl phthalate to increase the solubility of rotenone in the oils. However, the use of intermediate solvents has not succeeded in making the toxicant permanently oil soluble. Oil-soluble substances, such as pyrethrin, which remain completely in the oil phase, would seem to afford much greater promise than those which are hydrophilic. During the year tests were made with a product containing nearly 4 per cent actual pyrethrins. Thus far, the attempt to increase the effectiveness of spray oils by the use of toxicants, in the experiments with this scale, has been unsuccessful.

Resistant scale investigations, I, II, G. P. Gray and A. F. Kirkpatrick (*Calif. Citrogr., 14 (1929), Nos. 8, pp. 308, 336, figs. 2; 9, pp. 364, 380, 381, figs. 2*).—The first part of this contribution relates to work with a strain of the black scale which was found in certain districts to be more resistant to insecticides than those in other districts. A series of single and double fumigations variously timed through the season indicated that the pest is more difficult

to kill during the second molting period, and that the scales surviving a fumigation are hardy individuals, more liable to survive subsequent treatment than are scales not previously fumigated. When black and red scale are stupefied by weak cyanide vapor, they are able to survive a subsequent stronger dose than when active. This phenomenon has been termed "protective stupefaction." It appears that such stupefaction may lower the scale kill when certain conditions retard distribution of gas or on account of gas leaking through the canvas and drifting to adjacent trees.

Part 2 of the contribution takes up the more practical phases of the investigation, dealing with methods employed in large-scale field experiments which have consistently improved the scale kill.

Experiments with oil sprays used in the control of the California red scale, Chrysomphalus aurantii (Mask.) (Homoptera: Coccidae), on lemons, W. Ebeling (*Jour. Econ. Ent., 25 (1932), No. 5, pp. 1007–1012, fig. 1*).—Studies conducted by the California Citrus Experiment Station here reported indicate "that the effectiveness of oil sprays is proportional to the heaviness of the oil and the percentage of oil used in the spray, and inversely proportional to the amount of spreader used in the spray. Within the range of sulfonation of the oils used in the tests, no significant difference in insecticidal efficiency of the sprays was caused by difference in sulfonation of the oils. Injury to foliage was found to be proportional to the heaviness of the oil and the percentage of oil used in the spray, and inversely proportional to the amount of spreader used and the sulfonation of the oil."

Control of the celery leaf-tier in Florida, W. E. Stone, B. L. Boyden, C. B. Wisecup, and E. C. Tatman (*Florida Sta. Bul. 251 (1932), pp. 23, figs. 10*).—Control work with the celery leaf tier, officially known as the greenhouse leaf tier, conducted in cooperation with the U. S. D. A. Bureau of Entomology in connection with the studies noted in Bulletin 250 (E. S. R., 68, p. 67), is reported.

Proper cultural and harvesting practices were found useful as aids in control of this insect, an attack of which results in a smaller yield, due to heavy stripping, and in a product of lower market value. Fresh pyrethrum dust, either alone or mixed with lime or sulfur, applied to dry plants on a calm day with a traction duster, was found effective in combating the larvae. It is pointed out that the dust must reach the heart of the celery plant in order to be effective against the leaf tier, and that the treatment should be directed against the immature larvae, which are more susceptible to the action of the pyrethrum than the nearly mature forms. Arsenicals are of little value in controlling the pest, and in addition their use may result in a dangerous residue in the harvested product.

[Codling moth investigations in Nebraska in 1928, 1929, and 1930], M. H. Swenk (*Nebr. State Hort. Soc. Ann. Rpts., 60 (1929), pp. 31–50, fig. 1; 61 (1930), pp. 27–46, fig. 1; 62 (1931), pp. 109–128, fig. 1*).—Annual reports of studies at the Nebraska Experiment Station of the life history of the codling moth as influenced by the prevailing conditions of temperature and humidity in 1928, 1929, and 1930, respectively, are here presented. The details of the work are presented in large part in tabular form. The life history of the pest at Lincoln each year is graphically summarized in diagrammatic form.

[Spray experiments with the codling moth at Shubert, Nebr., in 1928, 1929, and 1930], W. W. Yocum (*Nebr. State Hort. Soc. Ann. Rpts., 60 (1929), pp. 51–58; 61 (1930), pp. 47–50; 62 (1931), pp. 45–48*).—The progress of control work with arsenical and summer oil sprays and bands is briefly reported upon.

Prediction of pale western cutworm increase in Montana is fulfilled, R. E. Wall (*Jour. Econ. Ent., 25 (1932), No. 5, pp. 1043–1048, figs. 2*).—As a contribution from the Montana Experiment Station (E. S. R., 63, p. 159), the author reports that in 1932 the first general outbreak of the pale western cutworm in Montana in 11 years took place, confirming the prediction made a season in advance. "Damage to approximately 140,000 acres of grain was recorded in 26 counties. It is expected that an analysis of the new data on the relation of weather to increase and decrease in cutworm abundance in 1931, 1932, and 1933 will permit of further refining of the forecasting method."

Notes on Prodenia praefica Grote, R. A. Blanchard and C. B. Conger (*Jour. Econ. Ent., 25 (1932), No. 5, pp. 1059–1070*).—In California, Nevada, and Oregon the cutworm *P. praefica* has periodically caused considerable damage. Alfalfa is the principal crop attacked, although severe damage has occurred to a large number of other field and truck crops. Biological studies conducted during 1930 and 1931 and observations on control during the widespread outbreak of 1930 are reported.

Detecting pink bollworms in cottonseeds by the X ray, F. A. Fenton and W. W. Waite (*Jour. Agr. Research [U. S.], 45 (1932), No. 6, pp. 347, 348, pl. 1*).—In X-ray work cooperative with the Texas Experiment Station the authors found perfect cottonseeds to show up well, without defects, but that imperfect seeds and infested seeds are not so easily distinguished. It was observed that live worms give a fairly characteristic picture, and that after checking the film with actual examination of the seed their appearance becomes familiar enough to rely on the picture alone for their detection. It is possible to photograph a thousand seeds at once, a few minutes being sufficient to arrange the seeds and make an exposure.

Some results with pyrethrum in the control of Mineola scitulella Hulst (Lepidoptera, Pyralididae), R. W. Haegele (*Jour. Econ. Ent., 25 (1932), No. 5, pp. 1073–1077*).—In control work with *M. scitulella*, a pest of prunes in southwestern Idaho (E. S. R., 66, p. 243), promising results were obtained by use of sprays containing pyrethrum. "The materials tested were pyrethrum extracts used in combination with kerosene emulsion, soap, and dormant type oil; a pyrethrum-rotenone preparation; nicotine sulfate and nicotine preparations; lime-sulfur and lead arsenate. Best results were obtained with a kerosene solution of pyrethrum in a kerosene-soap emulsion spray, which gave a kill of 93 per cent. The larvae became greatly activated in the buds sprayed with this material, the activity ceasing in about two hours, after which time death occurred."

Mortality of Rhagoletis completa Cress. (Diptera: Trypetidae) through ingestion of certain solid materials, A. M. Boyce (*Jour. Econ. Ent., 25 (1932), No. 5, pp. 1053–1059, fig. 1*).—Ingestion studies at the California Citrus Experiment Station, in which lead arsenate, barium fluosilicate, cryolite, copper carbonate, hydrated lime, talc, diatomaceous earth, bentonite, sulfur, and ground tobacco leaves were employed, demonstrated that adult flies (*R. completa*) actually take undissolved particles into the stomach. The results of toxicity studies in which the above materials were employed are graphically presented.

The alimentary canal of the apple maggot (Rhagoletis pomonella Walsh) (Dipt.: Trypetidae), R. W. Dean (*Ann. Ent. Soc. Amer., 25 (1932), No. 1, pp. 210–223, pls. 4*).—A report of studies of the gross anatomy and histological structure of the alimentary canal of the apple maggot.

The effects of temperature and moisture on the distribution of the Mexican bean beetle, Epilachna corrupta Muls., H. L. Sweetman (*Ann. Ent.*

Soc. Amer., 25 (1932), No. 1, pp. 224–240, figs. 16).—This subject is dealt with under the headings of a review of the literature, seasonal history, distribution, environmental requirements, methods of analysis, regions of the United States, discussion, and conclusions. The conclusions are limited to the effects of the temperature and moisture conditions in the various regions, other factors, such as food, which may also influence the abundance and distribution not being considered.

The digestive enzymes of the Colorado potato beetle and the influence of arsenicals on their activity, D. E. Fink (*Jour. Agr. Research [U. S.], 45 (1932), No. 8, pp. 471–482*).—In studies of the normal insect, with few exceptions all the enzymes worked with, including amylase, lactase, invertase, lipase, and the proteolytic enzymes, were present only in the mid-gut and regurgitated liquid. In the exceptional cases it is believed that parts of tissue from the mid-gut may have adhered to the fore-gut and hind-gut during the process of dissection. This assumption is based on the fact that only a few experiments indicated digestion in either the fore-gut or hind-gut, and that the digestive activity of the enzymes in these instances was extremely slight.

The experiments reported show quite clearly that arsenic does not influence the digestive enzymes of Colorado potato beetles fed on sprayed foliage to the extent of inhibiting their normal activity. In general, when they are fed on foliage sprayed with an arsenical, there is but little retardation of the activity of amylase and tryptic enzymes, and none at all of enzymes active in the digestion of disaccharides and fats. However, the injection of arsenical suspensions directly into the insect mouth results in complete inhibition of the activity of the proteolytic enzymes.

Injury and distribution of potato flea-beetle in Washington, Epitrix cucumeris Harris, Epitrix subcrinita Leconte, R. L. Webster (*Jour. Econ. Ent., 25 (1932), No. 5, pp. 976–980*).—This contribution from the Washington College Experiment Station reports upon observations made in the course of the investigations previously noted (E. S. R., 67, p. 578). In counts made of more than 40,000 beetles, the relative number of the potato flea beetle and *E. subcrinita* varied greatly in different areas.

Dicerca divaricata as a defoliator, R. Hutson (*Jour. Econ. Ent., 25 (1932), No. 5, p. 1026*).—This buprestid beetle is reported as injuring maple at L'Anse, Mich., by severing the petiole, the defoliation of small trees under observation having been almost complete.

Experiments to determine the attractiveness of various aromatic compounds to adults of the wireworms Limonius (Pheletes) canus Lec. and Limonius (Pheletes) californicus Mann., R. S. Lehman (*Jour Econ. Ent., 25 (1932), No. 5, pp. 949–958, pl. 1*).—The reaction of males and females of *L. canus* and *L. californicus* to some 150 aromatic compounds tested in the laboratory is reported upon in tabular form. Fourteen of the most attractive of these compounds, as well as four others, were used in traps in the field. Some of the fatty acids, namely, caproic, lactic, butyric, and valeric, appeared to be sex attractants.

Carbon disulphide as a control for wireworms, M. C. Lane and K. E. Gibson (*Jour. Econ. Ent., 25 (1932), No. 5, pp. 958–967, pl. 1, figs. 2*).—Several years' work have shown the use of carbon disulfide to give a practical and efficient control of the wireworms in the soil under certain conditions, namely, a loose damp soil, a diffusion distance of 17 in. or less, and a dose of at least 1 oz. "A good kill of wireworms was obtained by placing 1-fluid-oz. doses of carbon disulfide in holes 4 in. deep and 18 in. apart, and fair control was obtained by spacing the same dose 24 in. apart."

The effect of sulphur on wireworms, R. E. Campbell and M. W. Stone (*Jour. Econ. Ent., 25 (1932), No. 5, pp. 967–970*).—In two sets of field experiments carried on for 4-year periods, in which up to 1,000 lbs. of sulfur per acre per year were applied, there was a decided reduction of the pH of the soil but no noticeable reduction in the wireworm population.

A mathematical theory of the growth of populations of the flour beetle, Tribolium confusum Duv., J. Stanley (*Canad. Jour. Research, 6 (1932), No. 6, pp. 632–671, figs. 9*).—Biological data relative to the growth of populations of the confused flour beetle have been examined mathematically, the individual insects being treated as moving or stationary particles amenable to the formulations of the kinetic theory of gases.

"Under certain simplified conditions, i. e., prior to the time of the first hatching of eggs, it was found possible to integrate the differential equations, obtaining curves showing substantial agreement with the biological data. Beyond this point, a function $\theta(t)$ enters, the form of which has not as yet been determined, though further work on this point will be carried out. Therefore, at present only a cursory discussion of the use of the function, etc., is given. Such information as can be gained regarding the population growth in the later stages, without knowledge of the actual form of $\theta(t)$, is also given."

Some nemic parasites and associates of the mountain pine beetle (Dendroctonus monticolae), G. Steiner (*Jour. Agr. Research [U. S.], 45 (1932), No. 7, pp. 437–444, figs. 5*).—The author reports upon material collected at Metaline Falls, Wash., in July and August, 1930, some of which was taken from beneath the bark of a pine that had been killed by the mountain pine beetle in 1929 and some from a pine that had become infested not more than 10 days before the date of collection. Some nemic associates and parasites of this beetle are described and their economic significance considered. The various phases of the mutual relationship of the mountain bark beetle and the nemas are dealt with, including free association, carrier relationship, ectoparasites, and endoparasites. The taxonomy of the genus Aphelenchoides is considered and three species new to science are described, namely, *Diplogaster occidentalis*, *A. conurus*, and *A. acroposthion.*

Biology and control of the black vine weevil, F. F. Smith (*U. S. Dept. Agr., Tech. Bul. 325 (1932), pp. 46, figs. 16*).—Studies of the life history and methods of control of the black vine weevil, conducted from October, 1925, to October, 1929, in collaboration with the Pennsylvania Bureau of Plant Industry at its Willow Grove laboratory, are reported upon in connection with a list of 56 references to the literature. Often recorded as doing damage to crops in North America, Europe, and Australia, it has been found frequently in greenhouses and nurseries in southeastern Pennsylvania. Fifty-two host plants are recorded in the literature, to which 25 new ones are added as the result of the present studies. The adults devour foliage or flowers by eating from the margins, and also notch petioles and girdle shoots, which die beyond the point of girdling. the new growth producing a witches'-broom effect. The young larvae feed on the rootlets, while the more mature ones cut off the larger roots and gouge out the crowns of herbaceous plants, or girdle the roots of woody plants. The injury caused by the larvae, although often less conspicuous, is more severe than that caused by the adults.

The incubation period of the eggs, which are dropped indiscriminately, averages 15 days, with extremes of 11 and 22 days. The larva molts five or six times during its development in the soil, and the normal period of development ranges from 72 to 113 days, though cold weather may interrupt development

during the winter. The mature larva forms a cell in the soil and enters the prepupal stage, which lasts from 3 weeks to 8½ months, depending upon the temperature. The pupal stage ranges from 15 to 22 days, with an average of 18 days. The adult spends an average of 8 days, with extremes of 4 and 17 days, in the cell before emerging. Adults feed at night on foliage or flowers and hide during the day. The preoviposition period ranges from 4 to 10 weeks. In the greenhouse isolated adults laid an average of 661.4 eggs the first season and 374.8 eggs the second. The maximum number of eggs laid by one adult for two seasons was 1,681. The adult life of one weevil was 671 days; its age from egg to death of adult, 816 days. In the greenhouse weevils oviposit during July and August, and the larvae mature from October to December. These develop into adults from January to March and oviposit during the succeeding summer on the next crop of plants.

Out of doors the winter is passed in the nearly full-grown larval, prepupal, or, less frequently, adult stage. In some years the larvae complete development before fall, but in most years a greater part of the larvae hibernate before completing growth. Adults emerge in June or July, oviposit during July and August, and go into hibernation in September, most of them dying, however, before spring. The few adults hibernating successfully emerge in May and oviposit through the second summer. The eggs laid early hatch to larvae which mature in the fall and spend the winter as prepupae. Out of doors adults laid up to 488 eggs during the first season, with an average of 216.1. One adult deposited 863 eggs in two seasons. The number of eggs laid varied with the species of host plant fed upon. These immature larvae complete feeding early in the spring and pupate with overwintering prepupae in May or June. Reproduction in six generations was found to be entirely by parthenogenesis, no males having been found during the course of the study. In commercial greenhouses the outdoor emerging adults enter the greenhouses and lay eggs, and the chief loss of plants is by the feeding larvae as they complete their growth in November.

No true parasites were found in these studies, but larvae were killed by the larvae of a carabid beetle, by an ant, *Formica* sp., and by two fungi, *Isaria* sp. and *Fusarium* sp. Preventive control measures include destruction of infested plants, crop segregation, elimination of outdoor hosts, and the erection of screen barriers to prevent the entrance of adults. Lead arsenate mixed with the potting soil kills the larvae, but its application is restricted to certain plants. The adults may be controlled in the greenhouse or nursery by poisoned sprays or dusts or by the use of poisoned bran bait or apple bait.

Relation of commercial honey to the spread of American foulbrood, A. P. Sturtevant (*Jour. Agr. Research [U. S.], 45 (1932), No. 5, pp. 257–285, fig. 1*).—Doubt as to whether honey from apiaries where infection exists is dangerous because of the possibility of its disseminating American foulbrood led to the investigation here reported, commenced during the summer of 1926 in an apiary near Somerset, Md., and since 1927 conducted at the bee culture field laboratory at Laramie, Wyo.

Honey or sugar sirup with a known content of spores of *Bacillus larvae* was fed to healthy colonies in experiments conducted in the apiary over a period of five years. At the same time laboratory studies were carried on with cultures of spores of *B. larvae* concerning certain growth phases of the organism, particularly the minimum number of spores that would produce vegetative growth on artificial culture media. Methods for demonstrating the presence or absence of spores of *B. larvae* in samples of commercial honeys were also investigated, and these honeys were studied in relation to their infectiousness as correlated with the spore-feeding experiments.

It was found that in order to produce American foulbrood infection in a healthy colony of bees the sugar sirup used for inoculation must contain at least 50,000,000 spores of *B. larvae* per liter. Of 73 colonies inoculated with numbers of spores ranging from approximately 5,000,000,000 to 100,000, 2 out of 11 receiving 50,000,000 spores showed infection but none out of 19 receiving less than that number of spores developed disease.

Preliminary experiments in which individual bee larvae were given known numbers of spores of *B. larvae* in 0.01 c c quantities of sugar sirup show that infection can be produced by this method, but with considerable difficulty. The minimum infectious dose was found to be 10,000,000 spores per larva.

The germination of spores of *B. larvae* and vegetative growth on a suitable artificial culture medium resulting from the inoculation of 556 culture tubes with seedings varying from approximately 50,000,000,000 to 500 spores per culture also shows that a certain minimum initial number of spores in the inoculum is necessary in order to produce growth. This minimum number of spores producing vegetative growth on a medium consisting of yeast-carrot extract, egg-yolk suspension, and agar was found to be approximately 50,000 in 1 c c of suspension inoculated.

It was found possible to demonstrate the presence of spores of *B. larvae* in 15 out of 187, or 8 per cent, of the samples of commercial honey examined by means of the centrifuge and the microscope. The preliminary results indicate that, even though spores of *B. larvae* may be demonstrated in a certain percentage of samples of commercial honey, in most instances they are probably present in such small numbers as to be less than the minimum number, 50,000,000 per liter, found to be capable of producing disease, and therefore are ineffective in the spread of American foulbrood.

A list is given of 31 references to the literature cited.

Some effects of reduced atmospheric pressure upon honey bee respiration, C. E. Woodworth (*Jour. Econ. Ent., 25 (1932), No. 5, pp. 1036–1042, fig. 1*).—In physiological studies of the honeybee in Wisconsin, respiration was found to be very markedly affected by changes in atmospheric pressure. It is concluded, however, that over a fairly wide range they can internally compensate for these changes.

Apicultural problems in Puerto Rico [trans. title], D. A. Rodríguez (*Puerto Rico Dept. Agr. and Com. Sta. Circ. 99 (1932), Spanish ed., pp. 22, figs. 5*).—This brief account furnishes practical information on the apicultural problems of production and marketing. Statistical data on honey exported from Puerto Rico, in pounds, and the price per pound obtained, together with a census of producers, colonies, and production in the island, are given in two appendixes.

The use of Trichogramma minutum (Hymenoptera Chalcididae) Riley in the control of the codling moth in Colorado, G. M. List and L. G. Davis (*Jour. Econ. Ent., 25 (1932), No. 5, pp. 981–985*).—In control work with the codling moth by use of the egg parasite *T. minutum*, in which mass liberations and colonizations were tested, the results varied in different orchards with both methods.

Little benefit was obtained by the liberations during years of high natural parasitism. "During seasons of low natural parasitism liberations can be responsible for a pronounced parasitism, but in no case has this been sufficient to show a marked control of the codling moth as indicated by fruit examinations. The mass liberation shows a considerable increase of parasitism over the colonization plan, but probably not enough to warrant the additional expenditure of time of liberation and cost of parasites. It is felt that a modifica-

tion of the two plans, giving liberations about six or eight days, should be more practical. The writers feel that the results are encouraging enough to justify continuing the experiment but believe the growers should not be led to expect too much from it. The true value can be determined only by long series of control experiments."

It is pointed out that there are several strains that behave quite differently in the laboratory and probably are just as distinct in the orchard, and that a careful study could well be made of all the orchard hosts. Under Colorado conditions the parasite continues to breed later than the codling moth, with the result that it must seek other host eggs. The presence of suitable later host eggs may therefore be as important as climatic factors in determining the overwintering Trichogramma population. The controlling of this by cultural or cover crop methods may give more pronounced results than the rearing and liberations.

Microgaster tibialis Nees as a hymenopterous parasite of Pyrausta nubilalis Hubn. in Europe, A. M. Vance (*Ann. Ent. Soc. Amer., 25 (1932), No. 1, pp. 121–135, figs. 8*).—This is a report of studies of a braconid which occurs as a rather important solitary parasite of the European corn borer in several parts of Europe. Since 1923, when importation into the United States from France was commenced, more than one-half million Microgaster cocoons have been shipped from Europe to the U. S. D. A. Bureau of Entomology Field Laboratory at Arlington, Mass. The present paper collates various data on the distribution, economic importance, and biology of this parasite as a factor in the control of the European corn borer in its European habitat, describes the adult, and presents certain morphological characters of the immature forms which may aid in the identification of the species.

This parasite, which is generally distributed in Europe, has been found of greatest economic importance as a parasite of Pyrausta in the one-generation area of northern France. The average parasitism for the 8-year period (1922–1929) in the region of Paris was 29.7 per cent, with maximums of 63.2 and 52.5 per cent in 1925 and 1926, respectively; and for a 6-year period (1924–1929), in the environs of Lille, the average parasitism by Microgaster equaled 16.4 per cent. In the two-generation area of the host in the Po Valley of Italy the average parasitism of the first generation of Pyrausta near Bergamo for the 7-year period (1924–1930) was 5.7 per cent. In these and other localities where studies have been made the degree of control by *M. tibialis* has shown considerable fluctuation.

Production and spread of the woolly aphis parasite, Aphelinus mali, in the Hood River Valley, L. Childs and D. G. Gillespie (*Jour. Econ. Ent., 25 (1932), No. 5, pp. 1013–1016*).—In work with the woolly apple aphid parasite *A. mali*, introduced from Michigan in 1929 by the Hood River Substation of the Oregon Experiment Station (E. S. R., 64, p. 459), 92,000 individuals have been reared and liberated in the Hood River Valley and other points. As a result, the parasite is now thoroughly established in over 40 Hood River orchards and spreading rapidly. In 1930 the average woolly apple aphid infestation per tree for all the check orchards was 30.2 per cent and for the two orchards with parasites 11.4. Random observations made in June, 1932, of the parasite at work in the orchards tended to confirm these figures. The seasonal history of the parasite, which has been closely checked for two seasons, shows eight complete generations in 1930 and nine in 1931.

The Sicilian mealybug parasite in Illinois, H. L. Dozier (*Jour. Econ. Ent., 25 (1932), No. 5, p. 990*).—The rearing of large numbers of the encyrtid parasite *Leptomastidea abnormis* (Gir.) from the Mexican mealybug, *Phenacoccus*

gossypii (T. & Ckll.), in the University of Illinois greenhouse at Urbana is recorded. This parasite is said to have been introduced from the Mediterranean region into California in 1914 and into Florida in 1917 to combat the citrus mealybug.

Notes on the biology of the pear leaf blister mite in the West, E. J. Newcomer and A. R. Rolfs (*Jour. Econ. Ent., 25 (1932), No. 5, pp. 985–988*).—The authors have found that the wintering pear leaf blister mites deposit eggs in the buds, that blisters are made by the feeding of the generation coming from these eggs, that the mites do not enter the blisters until they are adult, and that this does not occur until the foliage is well out. Sprays applied after the buds have begun to open are apparently effective.

Control of powdery mildew and red spider on greenhouse cucumbers, L. J. Alexander and H. C. Young (*Science, 74 (1931), No. 1917, pp. 314, 315*).—This contribution from the Ohio Experiment Station refers briefly to a season's experience which indicates that the common red spider and powdery mildew (*Erysiphe cichoracearum*) found on greenhouse cucumbers can be successfully controlled by use of a hydrophilic colloidal sulfur spray. The strength of spray suggested is 2 lbs. of the sulfur paste to 100 gal. of water.

A greenhouse with a severe infestation of red spider was sprayed, using 1.5 lbs. of the colloidal sulfur to 100 gal. of water, followed by a second spray a week later at 1.75 to 100, and four additional sprays of 2 to 100 at weekly intervals. After the second and third sprays spiders were scarce and mildew was almost absent. In the adjoining houses spiders were serious and mildew quite prevalent. It is pointed out that DeOng (E. S. R., 52, p. 859) found this spray to be very effective against the clover mite in California, but concluded that it would not replace lime-sulfur.

Bibliography of helminthology for the year 1930, compiled by A. Walton (*St. Albans, Eng.: Imp. Bur. Agr. Parasitol., 1932, pp. 62*).—The contributions on helminthology for 1930 appearing in 346 publications are listed according to the publications in which they appear. An authors' index and addenda are included.

ANIMAL PRODUCTION

[Experiments with livestock] (*Idaho Sta. Bul. 192 (1932), pp. 21, 36–38, 40, 41, 42, 43, 44*).—Preliminary results of studies with cattle include data on methods of watering and sheltering and on the value of various rations for fattening steers. For the sheep studies data are reported on protein supplements and various other rations for fattening lambs and on methods of wintering the farm flock. The work reported with poultry includes studies on humidity in relation to hatchability of eggs, mineral supplements in chick rations, and effects of different types of irradiation on growth of chicks. With swine data are reported on the value of winter wheat as a forage crop.

[Investigations with livestock] (*Kentucky Sta. Rpt. 1931, pt. 1, pp. 41–46, 47, 54, 55, 58, 59*).—The poultry studies include data on the nutritive value of eggs as affected by the feeding of cod-liver oil to hens, a technic for testing the pH of fresh eggs, metabolism in the chicken, effect of outcrossing on egg production, methods of feeding grain to chickens, grading mountain mongrel hens by use of purebred cocks, and selective flock breeding.

Studies with swine include results of a comparison of corn and wheat for growing and fattening and with yearling steers a comparison of shelled corn and cracked wheat for fattening.

[Investigations with livestock] (*Michigan Sta. Rpt. 1931, pp. 245–247, 289, 290, 291*).—Under cattle studies are reported data on a comparison of corn,

oats, and barley for fattening calves and a comparison of the economy of full feeding or delayed feeding of grain to calves after weaning. Sheep studies include data on a comparison of corn, oats, and barley for fattening lambs and a comparison of the efficiency of native fine wool, native medium wool, and western lambs in the feed lot. Work reported with swine includes data on the value of cull beans as a protein supplement; a comparison of corn, barley, and oats for fattening pigs; and the value of alfalfa leaf meal as a supplement to grain rations. All of these studies were reported by G. A. Brown.

The poultry studies include data on the value of different baby chick rations, artificial heat in poultry houses, and barley as a poultry feed. Feeding and management tests with rabbits were also conducted. These studies were reported by C. G. Card.

[**Experiments with livestock**] (*Mississippi Sta. Rpt. 1932, pp. 14, 15, 16, 17, 39–41, 45, 48, 49*).—In cattle studies data are reported on the influence of creep-feeding calves while running with their dams on good pasture and management of the breeding herd of beef cattle, by H. H. Leveck, and native and improved pastures for grade calves, burning native grass pastures, and pasture improvement, by S. W. Greene.

The tests with mules include data on the value of corn, cottonseed meal, blackstrap molasses, cottonseed hulls, and Johnson grass hay for work mules, and the effects of large amounts of cottonseed meal on the efficiency of work animals, by Leveck and W. E. Ayres.

The swine tests include data on the value of green soybean pasture in pork production and the value of oyster shell flour as a source of calcium for fattening hogs, by Leveck, and the use of pasture in finishing lightweight hogs for market, by Greene.

The poultry data deal with the value of charcoal in the ration of laying hens, cottonseed meal for laying hens, the use of yellow corn meal for supplying vitamin A to growing chicks, and all mash rations compared with mash and grain rations for laying hens and growing chicks, by G. R. Sipe.

Sheep tests include data on crossing Rambouillet rams on native ewes and control of intestinal parasites, by Greene.

The effect of artificial drying on the availability of the nutrients of alfalfa hay, E. B. Hart, O. L. Kline, and G. C. Humphrey (*Jour. Agr. Research [U. S.], 45 (1932), No. 8, pp. 507–511*).—The Wisconsin Experiment Station conducted a study to determine the availability of the nutrients of artificially dried hay as compared with that of hays cured in the ordinary way. Three lots of second-growth alfalfa cut from the same field were prepared in the following ways: Lot 1 was cut and dried immediately; lot 2 was cut, raked into a windrow one afternoon, and dried just before noon the next morning; and lot 3 was cut and cured in the usual manner. Studies on the digestible dry matter, digestible protein, and available calcium were made with three high-producing Holstein cows that were in the early part of their lactation period. Each lot of hay was fed through a 3-weeks experiment period with a basal grain and silage ration.

The results showed that there was no material difference in the availability of the dry matter, protein, and calcium of the three hays. It was evident that the exposure of the hay to a temperature of from 480 to 535° C. for 40 seconds did not affect the availability of the nutrients studied.

Commercial feeding stuffs, L. S. Walker and E. F. Boyce (*Vermont Sta. Bul. 338 (1932), pp. 48*).—This is the usual report (E. S. R., 66, p. 655) of analyses of the protein, fat, and fiber contents of 2,357 samples of feeding stuffs collected for official inspection during December, 1931.

I, Winter versus summer feeding of corn to heavy steers finished on grass. II, Wheat as a fattening feed for yearling steers, E. S. Good and W. J. Harris (*Kentucky Sta. Bul. 332 (1932), pp. 267–285, figs. 2*).—In the first part of this bulletin the results of a 3-year study (E. S. R., 64, p. 164) are reported. It was found that heavy steers carried through the winter on roughage alone and finished on grass with corn made larger and more profitable gains than similar steers that received corn during the winter and which were finished on grass alone. The steers that received corn on grass shrank from 15 to 30 lbs. less per head during shipment to market than the steers on grass alone. On the average steers fed grain on grass returned $2.90 more per head than those fed corn during the winter. There was no significant difference in the dressing percentage, amount of fat, color of lean, or weight of carcasses between the two lots.

In the second part, results of a test with two lots of 10 steers each, averaging 721 lbs. per head, are reported. The steers were fed for 176 days on a basal ration of cottonseed meal, corn silage, oat straw, ground limestone, and salt, and in addition the respective lots received cracked wheat and shelled corn. The average daily gains were 2.4 and 2.1 lbs. per head in the respective lots. The cost per 100 lbs. of gain was lower in the wheat-fed lot. The wheat-fed steers showed a greater degree of finish and yielded a higher percentage of beef than the corn-fed steers. The carcasses of the wheat-fed steers had a deeper covering over the back and ribs, whiter fat, and a brighter red lean meat than those of the steers fed corn.

Feeding flax straw to cattle, J. W. Wilson, T. Wright, and F. Fenn (*South Dakota Sta. Circ. 3 (1932), pp. 7*).—Tests were conducted over a 2-year period to determine whether flax straw could be fed safely to cattle. Four lots made up of three bred cows and three yearling steers were fed during the two tests. All lots received a limited ration of ground corn, salt, and water, and in addition the respective lots received alfalfa hay, flax straw, one-half as much alfalfa as lot 1 and all the flax straw they wanted, and one-fourth as much alfalfa as lot 1 and all the flax straw they would eat. In all, 24 calves were dropped during the experiment, all of which were strong at birth and only one of which was considered undersized. No difficulties were encountered with the cows fed flax straw. At the close of each test the steers in lot 2 were killed and their stomachs and intestines were examined, but no unnatural conditions were found to exist. Each year the steers in all lots made creditable gains. The results of the experiment indicate that flax straw has a high feeding value for both pregnant cows and yearling steers.

Studies in the biology of the fleece of the Scottish Mountain Blackface breed of sheep, F. F. Darling (*Ztschr. Zücht., Reihe B, Tierzücht. u. Züchtungsbiol., 24 (1932), No. 3, pp. 359–390, figs. 34; Ger. abs., pp. 389, 390*).—This study was undertaken at the University of Edinburgh, Scotland, to determine how the fleece of the Scottish Mountain Blackface sheep differs from that of other types, the kinds of fiber making up the staple, the proportion of the fibers in which they occur and the proportion in different areas of the body, whether these proportions are stable, and the effect of geographical conditions on the fiber.

It was found that more kemp and long hair appeared in the fleece of the haunch than in that on the shoulder, and there was a distinct kempy area on the saddle. The fleece was made up of approximately 73.5 per cent of wool, 20.5 per cent of long hair, and 6 per cent of kemp. By weight these proportions were 42, 52, and 6 per cent, respectively. There was no correlation between the proportion by count of the wool fibers and the proportion by weight,

but there appeared to be a slight but not significant correlation between the percentage of kemp by count and by weight. The wool fraction of the fleece was most stable, the long hair fraction less so, and the kemp fraction very variable. As the animals increased in age, the percentage of wool fibers increased and the percentage of long hair decreased. The wool was of an annual growth, the long hair grew continuously, and the kemp came into the fleece in January and February and was shed in October, November, and December. The long hair grew at a faster rate than the wool fibers, and the character of the hair determined the market type of the fleece.

Lentil meal as a protein supplement in pig rations, A. W. M. KITCHIN (*Scot. Jour. Agr., 15 (1932), No. 1, pp. 59–62*).—In a test with two lots of 10 pigs each at the School of Agriculture, Cambridge, England, it was found that 10 parts of lentil meal supplemented with 1 per cent of a mineral mixture made up of three parts of ground limestone and one part of salt could be used to replace five parts of fish meal in a fattening ration. The above supplement did not decrease the rate of gain, but did reduce the cost of gains. The ration containing lentil meal was very palatable.

Type in market swine and its influence on quality of pork, J. E. NORDBY (*Idaho Sta. Bul. 190 (1932), pp. 8, figs. 4*).—This study was undertaken to determine what effect type in market hogs has on the yield of lard, leanness of cuts, and general quality of pork. For slaughtering, two groups of five pigs each were selected. One group was of the sort generally classified as large type and the other group of chuffy type. Both lots were slaughtered after being off feed for 24 hours.

There was no appreciable difference in the dressing percentage of the two lots. The chuffy hogs produced a higher percentage of fat than the large-type hogs. The excessive amount of fat on the chuffy-type hogs lowered the quality of the wholesale cuts, particularly of the bellies. When lard sells for less than the wholesale cuts, the type of hog which yields the highest percentage of lean cuts should be the most profitable slaughter hogs.

Histology of the skin of the Mexican hairless swine (Sus scrofa), L. T. DAVID (*Amer. Jour. Anat., 50 (1932), No. 2, pp. 283–292, figs. 6*).—The material examined in this study consisted of samples of skin from corresponding regions of a normal, a heterozygous, and a homozygous hairless individual, aged 9 months, 5 years, and 18 months, respectively.

The "hairlessness" in swine consists of an agenesis of a part of the follicles. The follicles that are present appear to be normal. There was a definite tendency toward irregularity in direction of the follicles in the skin of the homozygous animal. The sebaceous glands were rudimentary. The sweat glands were few in number in the heterozygous and homozygous animals, their reduction being proportional to the reduction in the number of hair follicles. In comparison with skins of the mouse, rat, and rabbit, the skins of swine, both normal and hairless, are much less specialized.

Osmotic relationships in the hen's egg, as determined by colligative properties of yolk and white, E. HOWARD (*Jour. Gen. Physiol., 16 (1932), No. 1, pp. 107–123, figs. 3*).—In this study the author has shown by means of direct freezing point determinations, dialyses, and vapor pressure measurements that the osmotic pressure of the yolk and white of hens' eggs is identical. This finding refutes the belief that the vital activity of the yolk membrane lies in maintaining the osmotic equilibrium between the yolk and white.

A study of shell texture of the hen's egg, W. F. HOLST, H. J. ALMQUIST, and F. W. LORENZ (*Poultry Sci., 11 (1932), No. 3, pp. 144–149, figs. 3*).—The eggs used in this study at the California Experiment Station were produced at the station poultry plant. They averaged one day old when taken for this work and were divided into three grades according to their shell texture.

The uneven eggshell translucency, ordinarily called poor shell texture, was found to be due to an uneven distribution of moisture throughout the shell proper. This poor shell texture was not a permanent characteristic and varied considerably in the egg after it was laid. Eggs of different shell textures showed relatively little variation in regard to keeping qualities, shrinkage, and porosity.

Hatchery management, R. C. HARTMAN and G. S. VICKERS (*New York: Orange Judd Pub. Co., 1932, pp. 386, figs. 108*).—This treatise was prepared to bring together present-day knowledge concerning the problems met in the commercial production and marketing of chicks. A large section of the book is devoted to advertising and selling methods, since this phase of the business is of major importance in determining the success of a hatchery.

Age changes in the heat production of chickens as measured by a graphic method.—A preliminary report, S. BRODY, E. M. FUNK, and H. L. KEMPSTER (*Poultry Sci., 11 (1932), No. 3, pp. 133–143, figs. 9*).—This paper from the Missouri Experiment Station is a preliminary report showing age curves of heat production of chickens as obtained by a graphic oxygen-consumption method. The results, dealing with the effect of age, sex, egg production, and protein level of the ration on growth and heat production, are presented in a series of graphs.

The difference in heat production of good- and poor-laying pullets was not marked. At certain times of the year the heat production of cockerels was about 25 per cent higher than that of pullets, but during April, May, and June the curves approached each other and ended in June with a higher heat production for pullets. This rise was thought to represent the energy expense of ovulation. Capons had a decidedly lower heat production than either cockerels or pullets.

The heat production of chicks in terms of calories reached a maximum at 2 weeks of age with 230 calories per kilo per day, then declined to about 50 to 60 calories at 8 months of age. The heat production per square meter of body surface reached a maximum at about 35 days of age with 1,100 calories per square meter per day, and then declined to about 800 to 900 calories at 4 months of age. When the percentage of milk in the ration was increased beyond 30 per cent there was a tendency to lower heat production. The best growth was obtained on a ration with a 19 per cent protein level, containing 30 per cent of dried skim milk.

Phosphorus distribution in chicken blood as affected by the diet, V. G. HELLER, K. R. HUNTER, and R. B. THOMPSON (*Jour. Biol. Chem., 97 (1932), No. 1, pp. 127–132*).—In studies at the Oklahoma Experiment Station it was found that the phosphorus content of chicken blood was high as compared to that of mammals, in this study from three to four times as high. The inorganic phosphorus of the plasma was only an insignificant fraction of the whole blood phosphorus. It was also established that an increase in the phosphorus content of the ration was followed by a corresponding increase in the phosphorus content of the blood.

Studies in protein nutrition of the chick.—I, The influence of different protein concentrates on the growth of baby chicks, when fed as the source of protein in various simplified diets, W. D. MCFARLANE, W. R. GRAHAM, JR., and G. E. HALL (*Jour. Nutrition, 4 (1931), No. 3, pp. 331–349, figs. 9*).—In this study at the Ontario Agricultural College, an effort was made to determine the growth value of such protein supplements as buttermilk powder, fish meal, cod-liver meal, meat meal, and tankage when fed as the sole source of protein in an otherwise synthetic diet. The study was made up of a series of five feeding experiments with chickens. The protein supplements were freed from the variable amount of fat which they contained by extracting with ether.

When fed with a basal diet made up of Marmite 15 per cent, cod-liver oil 3 per cent, bone ash to make the total ash of all diets 4.36 per cent, and white rice to 100, equal amounts of crude protein from buttermilk powder, fish meal, or meat meal had practically the same effect on growth. A lower mortality was obtained when the buttermilk powder was fed. Equal amounts of protein from cod-liver meal gave subnormal growth, indicating a lower biological value so far as growth was concerned. Attempts to reduce the extraneous nitrogenous material in the basal diet by substituting ground paper pulp and dextrin for the white rice resulted in more or less complete failure in growth. It was not found possible to grow normal chicks on a ration in which the sole source of protein was of animal origin. The use of white rice in the simplified diets improved growth, prevented the occurrence of leg weakness, and reduced mortality. Some evidence is discussed which suggests that this effect is due to the rice protein, and that some protein of vegetable origin or of a source as yet undetermined associated with vegetable material is necessary for normal chick nutrition.

Carotene and xanthophyll as sources of vitamin A for the growing chick, O. L. KLINE, M. O. SCHULTZE, and E. B. HART (*Jour. Biol. Chem., 97 (1932), No. 1, pp. 83–91, figs. 4*).—In studies at the Wisconsin Experiment Station, chicks were fed a basal ration which produced vitamin A deficiency in from 3 to 4 weeks, but which gave normal growth and development when supplemented with vitamin A. It was found that xanthophyll (melting point 174° F.) prepared from spinach could not be used as a source of vitamin A for chicks with this ration. However, it produced no toxic effects, even when fed at levels of 0.25 mg per chick daily. Carotene (melting point 172.5°) prepared from the same source could be used to supply vitamin A when fed in proper amounts. When chicks reached an age of from 7 to 8 weeks, 0.03 mg of carotene daily was not sufficient to prevent rickets when used as the sole source of vitamin A. Chicks that had been depleted of vitamin A required more than 0.05 mg of carotene daily in order to grow to maturity.

The reaction of the chicken to irradiated ergosterol and irradiated yeast as contrasted with the natural vitamin D of fish liver oils, H. STEENBOCK, S. W. F. KLETZIEN, J. G. HALPIN, ET AL. (*Jour. Biol. Chem., 97 (1932), No. 1, pp. 249–264*).—Studies were undertaken with chicks at the Wisconsin Experiment Station to ascertain the reasons for the differences in the effectiveness of natural vitamin D of cod-liver oil as compared with irradiated products.

In these tests ergosterol and yeast activated by ultra-violet radiations were inefficient sources of vitamin D for chicks. While 1 per cent of cod-liver oil of average potency promoted normal bone growth, it required from 40 to 120 per cent of cod-liver oil equivalent in the form of irradiated ergosterol and from 7.5 to 60 per cent of cod-liver oil equivalent in the form of yeast to give the same results. Good results were obtained with 4 per cent of egg meal and 1.6 per cent of the irradiated mold Penicillium. Burbot-liver oil had practically the same antirachitic efficiency as cod-liver oil.

Excessive doses of irradiated ergosterol were toxic for chicks. This toxicity was manifested by anorexia, loss in body weight, loss in dry organ weight of spleen, heart, liver, and lung, an increase in blood serum calcium, and a decrease in blood phosphorus. The vitamin D produced by ordinary irradiation of ergosterol with a quartz mercury lamp was a different substance from that found in cod-liver oil. The addition of carotene had no effect on the antirachitic activity of the irradiated ergosterol.

Studies in vitamin A avitaminosis in the chick, C. A. ELVEHJEM and V. F. NEU (*Jour. Biol. Chem., 97 (1932), No. 1, pp. 71–82, figs. 2*).—This study with chicks was undertaken at the Wisconsin Experiment Station to determine

whether the symptoms described by several workers were specific for vitamin A deficiency and whether conditions can be standardized sufficiently to use chicks in vitamin A studies. Other objects of the study were to determine whether the uric acid content of the blood increases during vitamin A deficiency, whether the above symptoms depend upon these blood changes, and whether the uric acid content of the blood depends on kidney degeneration.

A standard ration that produced vitamin A avitaminosis in chicks was devised, and the growth curves of chicks reared on this ration alone and on the ration plus 2 per cent of cod-liver oil are presented. The typical symptoms of vitamin A deficiency in the chicks are described.

It was found that the uric acid content of the blood of normal chicks was approximately 5 mg per 100 c c of whole blood, while in vitamin A deficient chicks this content varied from the normal in amounts to as high as 44 mg per 100 c c of blood. The kidneys showed definite pathological changes during severe vitamin A avitaminosis, and the amount of uric acid in the blood depended upon the degree of kidney damage. Vitamin A deficiency did not disturb the uric acid metabolism, but did injure the structure of the kidney sufficiently to prevent normal uric acid elimination.

The artificial propagation of ring-necked pheasants, E. W. Callenbach, R. R. Murphy, and C. A. Hiller (*Poultry Sci., 11 (1932), No. 3, pp. 150–157, figs. 2*).—This study was undertaken at the Pennsylvania Experiment Station to determine whether ordinary methods of artificial incubation and brooding, with modifications necessary because of peculiarities of the pheasant, could be used satisfactorily in commercial pheasant propagation.

Satisfactory incubation results were obtained when pheasant eggs were incubated up to but not exceeding 20 days in a cabinet-type, agitated-air machine at a relatively high humidity, with the remainder of the incubation period and hatching being done in a sectional, still-air-type machine. Pheasant chicks made more rapid growth on a high protein ration than on a ration suitable for chicks of the domestic fowl. The pheasant chicks were brooded satisfactorily in close confinement up to 8 weeks of age, but battery brooders were not satisfactory when operated as recommended for domestic chicks because of piling, feather picking, and cannibalism.

Rabbit-keeping, J. N. Pickard ([*Gt. Brit.*] *Min. Agr. and Fisheries Bul. 50 (1932), pp. V+19, figs. 3*).—The breeds of rabbits, housing, feeding, breeding, preparation for market, and marketing rabbits as a commercial phase of agriculture are described in this bulletin.

DAIRY FARMING—DAIRYING

Modern milk production ([*Gt. Brit.*] *Min. Agr. and Fisheries Bul. 52 (1932), pp. V+41*).—This bulletin was prepared to assist those interested in adopting the most up-to-date methods of milk production. The text contains information on breeds of cattle, methods of milking, value and means of maintaining records, and sanitation.

[Experiments with dairy cattle and dairy products] (*Idaho Sta. Bul. 192 (1932), pp. 27–29, 41, 42*).—From the work with dairy cattle results are reported on studies with bull associations, continuous use of proved sires, variations in breeding efficiency of dairy herds, a comparison of pea meal and linseed meal for milk production, dried skim milk and dried buttermilk for feeding calves, water requirements of dairy calves, water consumption of dairy cows, and the vitamin A content of pasture grasses. Dairying studies include data on the standardization of milk for cheese making.

[Studies with dairy cattle and dairy products], E. L. Anthony (*Michigan Sta. Rpt. 1931, pp. 273–280*).—Preliminary results of experiments with dairy

cattle are reported on the value of bulk in the make-up of a grain mixture; good hay as a carrier of a factor or factors found in cod-liver oil; sufficient minerals supplied by good rations; relationship between form and milk production of dairy cattle; alfalfa leaves as a substitute for purchased protein; cottonseed meal as a source of protein; the relative value of bone meal and raw rock phosphate as sources of calcium and phosphorus; the effect of fluorine feeding on health and osteoid tissue; raising calves on a minimum amount of milk; effect of feeding raw crushed cottonseed high in gossypol to dairy cattle; effect of low phosphorus rations on heifers; the relation of magnesium to calcium, phosphorus, and vitamin D in rations for calves; and simple v. complex grain mixtures for cows.

Dairy studies included data on the comparative value of factors which affect clean milk production; milk serum separation from bottled cream; temperatures of Upper Peninsular water available for cooling milk and cream; daily variations in the fat content of milk and cream; effect of several creamery practices upon the completeness of churning and upon the keeping quality of butter; effects of butter, condensed milk, and skim milk powder in ice cream mixes; effectiveness of varying types of cleaners and cleansers in the dairy plant; effect of aging ice cream mixes made from cream and butter as sources of fat; and the effect of cream acidity on the keeping quality of the cream.

[Experiments in dairy farming and dairying] (*Mississippi Sta. Rpt. 1932, pp. 20, 21–28*).—Data are reported on tests of balanced rations for dairy cows using different dry roughages; home-grown feeds for dairy cows; the effect of some southern roughages when fed with basic grain mixture on the fat constants, flavor, texture, and standing-up properties of southern butter, by J. S. Moore; and the importance of anaerobic spore-forming bacteria in the deterioration of butter, by C. F. Briscoe.

Feeding and care of the dairy cow in Puerto Rico [trans. title], W. M. Ellison (*Puerto Rico Dept. Agr. and Com. Sta. Circ. 97 (1932), Spanish ed., pp. 67, pl. 1, figs. 16*).—This is a popular publication dealing with the feeding and management of dairy cattle under Puerto Rico conditions.

[Experiments with dairy cattle] (*Vermont Sta. Bul. 344 (1932), pp. 14, 15, 16*).—This report includes preliminary results of comparative yields of grass plats cut at various intervals; digestibility of artificially dried young grass v. green grass; and the feeding value of artificially dried young grass.

Calcium and phosphorus requirements of dairy cows.—II, Weekly balances through lactation and gestation periods, H. B. Ellenberger, J. A. Newlander, and C. H. Jones (*Vermont Sta. Bul. 342 (1932), pp. 20, figs. 12*).—Since the last report on this study (E. S. R., 66, p. 664), four additional trials have been completed on the calcium and phosphorus balances of five cows through complete lactation and gestation periods. Three animals finished their second and one her third lactation and gestation periods with positive balances of calcium and phosphorus, except one cow that had a negative calcium balance. There was a marked increase in the amount of calcium stored and a slight decrease in the amount of phosphorus retained when mineral supplements were fed as compared with the storages when no supplements were used. Considering all trials of each cow with and without mineral supplements, there was a substantial storage of both calcium and phosphorus in every case.

Cracked wheat vs. cracked corn for cows (*Kentucky Sta. Rpt. 1931, pt. 1, pp. 46, 47*).—Preliminary results of this comparison are given.

Report of cattle-breeding in Jamaica and Trinidad, J. Hammond ([*Gt. Brit.*] *Empire Marketing Bd.* [*Pub.*] *58 (1932), pp. 66, figs. 64*).—This is a report of a survey of breeding studies in Jamaica and Trinidad. The studies were undertaken to determine the inheritance of milk yield, fat percentage, and other characteristics of cows crossbred from the Indian zebu.

The hemoglobin content of the blood of dairy cattle, H. J. Brooks and J. S. Hughes (*Jour. Nutrition, 5 (1932), No. 1, pp. 35–38*).—In this study at the Kansas Experiment Station the hemoglobin content of the blood of calves in four dairy herds was determined, and at the same time a study of all ages was included. In all a total of 335 determinations were made on 297 head.

The mean hemoglobin content of the blood of the animals examined was 10.96±0.064 g per 100 c c of blood. Such factors as breed, age, and prolonged fasting did not appear to affect appreciably the hemoglobin content, and there were no significant individual variations from day to day.

Quantity of milk obtained from amputated cow udders, W. W. Swett, F. W. Miller, and R. R. Graves (*Jour. Agr. Research [U. S.], 45 (1932), No. 7, pp. 385–400, fig. 1*).—In this paper from the U. S. D. A. Bureau of Dairy Industry, the results are discussed of a study to determine the average recovery of milk obtained by milking the amputated udders of 11 cows. The average milk production of the cows before slaughter was compared with that obtained in two post-mortem milkings. The data are divided for two groups of cows, one group felled by a blow on the head and their udders permitted to chill after death, and the other group killed by shooting and their udders held at approximately blood temperature until after the second post-mortem milking.

The average recovery of milk was 61.1 per cent of the ante-mortem yield in group 1 and 75.3 per cent for group 2, with an average for both groups of 70.2 per cent. About 80 per cent of the milk from the amputated udders was obtained at the first post-mortem milking. The relation between the recoveries of milk in the first and second post-mortem milkings was practically the same for both groups of cows.

Composition of milk obtained from amputated cow udders, W. W. Swett, F. W. Miller, and R. R. Graves (*Jour. Agr. Research [U. S.], 45 (1932), No. 7, pp. 401–419, fig. 1*).—A study was made of the quality of the milk obtained from the amputated udders described in the above experiment. The fat test of the post-mortem milk was on the average about half as high as that of the ante-mortem milk. In the group of cows whose udders were allowed to chill after death, the fat test of the first post-mortem milk was half as high as in the milk obtained before death, while the second post-mortem milk was about half as high in fat as the first post-mortem milk. When the temperature of the udder was controlled, the first post-mortem milk had half as much fat as ante-mortem milk, but the second post-mortem milk was higher in fat than the first post-mortem milk. Regardless of the method of killing or handling the udder after death, it was not possible to recover more than 40 per cent of the total butterfat yield that was obtained in the ante-mortem milking. Flushing out the secretory system of amputated udders with a solvent increased to some extent the total amount of butterfat recovered. Not more than 44 per cent of the fluid injected into amputated udders was subsequently recovered.

The percentage of total solids was markedly lower in the first post-mortem than in the ante-mortem milk, and still lower in the second than in the first post-mortem milk. Keeping the udders warm reduced the decline in percentage of total solids from the first to the second post-mortem milkings. The percentage of solids-not-fat was practically the same in the first post-mortem and the ante-mortem milk, but lower in the second post-mortem milk. Controlling the temperature of the udder had no apparent effect on the percentage of solids-not-fat. The ash content of the first post-mortem milk was higher and that of the second post-mortem milk distinctly higher than that of ante-mortem milk. Total protein was practically the same in first post-mortem and ante-mortem milk, but lower in second post-mortem milk. The fat-protein ratio

followed a trend similar to that of the butterfat test. On the average the percentage of lactose in the first post-mortem milk was practically the same as in ante-mortem milk, but the second post-mortem milk had a much lower percentage.

The most outstanding difference in the milk obtained from ante- and post-mortem milkings was in the butterfat test.

A study of the fat-globule size in milk, M. H. Campbell (*Vermont Sta. Bul. 341 (1932), pp. 67, figs. 3*).—This study was undertaken (E. S. R., 64, p. 870) to study the manner in which the fat-globule size in cow's milk is inherited. After comparing different methods of measuring the globule size, it was found that by diluting milk to 100 times its volume with equal parts of water and glycerin and mounting the dilution in a hemacytometer chamber the measurements could be very accurately made by use of the euscope in connection with the microscope.

Environmental factors such as injury, sickness, or sudden changes of condition, usually brought about a marked increase in fat-globule size. Changes in feed increased the size of globules in some cases, decreased it in others, and still others had no apparent effect on size. The fat globules were usually largest during the first two weeks of lactation, declined most rapidly in size during the next two months, and thereafter the decline was slow, but usually continued until the end of normal lactation. The mean fat-globule volume of Guernsey milk was $28.4\mu^3$ at the beginning of lactation, declined to $13.4\mu^3$ at about 42 weeks, and had an average volume for the period of 18.8μ.[3] For Holsteins the mean size ranged from $22.1\mu^3$ at the beginning to $6\mu^3$ at 42 weeks, with an average for the period of 10.4μ.[3] The mean volume for individual Guernsey cows was more variable than for Holsteins, while Angus seemed to have a higher mean size than Guernseys.

In the F_2 crosses those resulting from the Guernsey-Holstein and Angus-Holstein matings showed a more rapid rate of decline in fat-globule size during the first 6 weeks of lactation than did Guernseys or Holsteins. The variation in means for individual animals was greater during the first two periods than during the remainder of lactation. There was a significant difference between the means of Guernseys and Holsteins and between Guernseys and the F_2s of this cross, but there was no significant difference between Holsteins and Guernsey-Holstein F_2s or Angus-Holstein F_2s. A number of factors appear to be involved in the inheritance of the size of fat globules in cow's milk.

The production of high quality milk.—IV, The influence of delayed cooling, combined with other cooling practices, upon the quality of milk, J. M. Frayer (*Vermont Sta. Bul. 343 (1932), pp. 61, figs. 14*).—In continuing this series of experiments (E. S. R., 65, p. 664), the phase reported in this bulletin was divided into three studies. In study 1 certain cooling practices were approximated as closely as possible to determine their effect on milk. Study 2 was concerned with the effect of three different methods of handling milk on its quality as measured by the standard plate count and by methylene blue reduction time. In the third study data are reported concerning the direct effect of delayed cooling of milk both upon the bacterial count and the reduction time.

It was found that cooling milk immediately to 50° F. was a fairly satisfactory procedure, even when it was held overnight. Cooling morning's milk immediately to 60° was also fairly satisfactory, but the same procedure for night's milk was unsatisfactory. Another unsatisfactory procedure was to allow milk to become warm once it had been properly cooled to 40° or below. The best results were obtained in respect to quality, both present and future, when milk was immediately cooled to and held at temperatures of 40° or below. Fresh

milk not cooled suffered progressively for each hour of delay in cooling. The lower the initial temperature of cooling, the better was the quality of the milk.

The relation of certain plant processes to flavor development in market milk, P. H. Tracy and H. A. Ruehe (*Jour. Dairy Sci., 14 (1931), No. 3, pp. 250–267*).—The first sentence of the final paragraph of the previous abstract (E. S. R., 67, p. 307), should read "The use of chlorine sterilizers should be confined to those of a noncorrosive nature, and all equipment treated with chlorine sterilizers should be rinsed with uncontaminated water before milk comes in contact with it."

Homogenization and milk rancidity, W. Dorner and A. Widmer (*Milk Plant Mo., 21 (1932), No. 7, pp. 50–57, 86, 88, fig. 1*).—In the course of some experiments at the Swiss dairy experiment station, Bern, it was observed that homogenized raw milk became distinctly rancid in a few hours after processing. A series of studies was undertaken to throw some light upon this problem.

It was found that the development of rancidity increased as the size of the fat globules decreased. Lipase of animal origin was believed to be the cause of this rancidity. In unhomogenized milk the lipase acted so slowly that its effect could not be detected by ordinary means. The process of homogenization by breaking up the fat clumps increased the surface of fat and permitted the lipase to act upon a larger surface, bringing about a more rapid decomposition of the fat. This lipase could be detected in all samples of milk, but the amount found in the milk of individual cows varied.

The lipase was very sensitive to heat and holding milk at 55° C. (131° F.) for 20 minutes inactivated it. Tests showed that neither the fat nor whey contained this lipase, and that it was associated with the casein of the milk. The lipase could not act in sour milk, requiring a distnctly alkaline reaction. Two types of lipase were found, one of which was always present and the other was found only in milk which became rancid without homogenizing.

From a practical point of view it appeared that only pasteurized milk or cream could be homogenized without danger of rancidity, and that mixtures of pasteurized and homogenized cream or milk with raw milk, raw skim milk, or raw cream may quickly become rancid.

Irradiated milk.—The amount of energy required to prevent rickets in chickens, G. C. Supplee, R. C. Bender, and M. J. Dorcas (*Jour. Biol. Chem., 97 (1932), No. 1, pp. 63–69, fig. 1*).—Continuing this series of studies (E. S. R., 67, p. 490), an experiment was undertaken to determine the degree of protection against rickets afforded to growing chicks by dried milk previously irradiated in fluid form.

It was found that in order to prevent rickets under the conditions of this experiment "the minimum amount of energy between 2,000 and 3,000 a. u. which must be applied per cubic centimeter of milk is approximately 1,328,000 ergs, or $1{,}784 \times 10^{14}$ quanta." It was calculated that the vitamin D content of such milk was 1.29 γ per liter. A calculated intake of 0.0341 γ of vitamin D per 100 g of body weight supplied by activated dried milk prevented rickets in chicks up to 8 weeks of age, but an average intake of 0.0267 γ failed to protect fully. On the whole there appeared to be a substantial degree of parallelism between the amount of energy applied to milk and its antirachitic properties.

Seasonal variation in fat losses in buttermilk, W. B. Combs (*Amer. Creamery and Poultry Prod. Rev., 73 (1932), No. 24, pp. 1000, 1002, figs. 2*).—The average butterfat content of the buttermilk resulting from churnings at the Minnesota Experiment Station creamery during the various months of the years 1926, 1929, 1930, and 1931 has been tabulated. It was found that there was a marked increase in the fat content of the buttermilk during the spring

months regardless of the care given the cream and the precautions followed in churning. To combat this loss it was recommended that cream be held at least from 2 to 4 hours, and longer if possible, at a temperature near 36° F. during the spring months, and churned at a temperature which will require about 60 minutes for the churning.

A study of several factors in the separation of serum from bottled cream, G. M. Trout and J. C. McCan (*Jour. Agr. Research [U. S.], 45 (1932), No. 8, pp. 483–500, fig. 1*).—A study was undertaken at the Michigan Experiment Station to determine the effects on the stability of cream of such factors as heat treatment of milk and cream, standardization, viscolization, and the addition of gelatin and salts.

It was found that separating milk at 120° F. appeared to prevent the formation, at least in part, of a distinct serum layer, but the volume of the layer remained practically the same regardless of the separating temperature. Pasteurizing milk at 160° for 15 minutes before separating decreased the volume but had no effect on the distinctness of the serum layer. Storing milk before separating had no appreciable effect on either volume or distinctness of serum layer. Pasteurization alone even at as high a temperature as 160° for 30 minutes failed to prevent the formation of a distinct layer. However, pasteurizing raw cream at 145, 150, 155, and 160° for 30 minutes decreased the volume and increased the distinctness of the serum layer, but there was no marked difference between the various temperatures. Agitating stored pasteurized cream had no significant effect on the volume but increased the distinctness of the serum layer, while speed of cooling pasteurized cream had little effect on either volume or distinctness.

Neither the method nor the heat treatment of the medium used in standardization had a material effect on the volume or distinctness of the serum layer, but standardization following pasteurization appeared to eliminate a part of the serum layer. Cream held in storage longer than 48 hours after being bottled usually showed a distinct serum layer. The volume of this layer increased at a decreasing rate as the cream was held, while the distinctness increased for from 48 to 72 hours and then gradually decreased. A creaming temperature above 32° increased the volume and decreased the distinctness of the serum layer. Viscolization at 160° and a pressure of 1,500 lbs. per square inch was as effective in preventing formation of the serum layer as 2,500 lbs. pressure at 145°. Adding 10 per cent of cream viscolized at 145° with unviscolized cream reduced the volume about 44 per cent.

Adding dicalcium phosphate had no influence on the volume or distinctness of the layer, while calcium chloride decreased the distinctness but had no effect on volume. Sodium citrate, sodium carbonate, and monocalcium phosphate did not influence the formation of the serum layer until added in amounts sufficient to precipitate the casein. Adding 0.3 per cent of gelatin to the milk before separating prevented the formation of the serum layer, and the same was true when 5 per cent of evaporated whole milk was added to the cream. Using 1 to 5 per cent of skim milk powder lessened the distinctness of the serum layer but did not entirely eliminate it.

On the basis of these results it is recommended, in order to eliminate this difficulty with milk so far as possible, that milk for skimming be pasteurized at 160° for 15 minutes, separated at 120°, standardized to the desired percentage with pasteurized whole milk, and bottled for not longer than 36 to 48 hours before final distribution.

Use of frozen cream in ice cream, W. V. Price (*Amer. Creamery and Poultry Prod. Rev., 74 (1932), No. 6, pp. 210, 212, 214, 216*).—In studies at the Wisconsin Experiment Station it was found that an ice cream mix containing

sweetened frozen cream as the sole source of milk fat had better whipping properties than a mix made with unsweetened frozen cream. Invert sirup and sucrose were equally effective for sweetening cream for storage when the concentration of each caused approximately the same depression in the freezing point of the cream. There were indications of a relationship between lecithin and the development of swell in ice cream.

Factors that must be considered in making ices and sherbets, S. L. TUCKEY (*Ice Cream Trade Jour., 28 (1932), No. 7, pp. 45–47*).—Studies at the Illinois Experiment Station showed that the hardness of water ice may be controlled by the percentage of overrun and sugar, with overrun exerting the greatest influence. Ices with an overrun of from 20 to 30 per cent and with a sugar content of from 30 to 33 per cent could be dished at the same temperature as ice cream.

When gums were used alone as stabilizers, the ice had a crumbly body and became excessively hard throughout, due to alternate hardening and softening. Low grade gums gave a low overrun and an undesirable flavor, but high grade gums caused rapid incorporation of air and no pronounced off flavor. With gelatin alone excessive overrun gave a soft product, but gelatin prevented crumbly body and produced an ice of smooth texture and clean flavor. A combination of gums and gelatin produced excessive overruns. Agar when used with gums gave all the beneficial effects of gelatin.

In water ices cooled to 6° F. the unfrozen water contained 62.5 per cent sucrose and was saturated with respect to sugar. Below 6° the sirup was supersaturated and crystallization could be started by exposure to air, shocking the solution by cutting the surface, or by seeding with sucrose crystals. A combination of corn sugar and sucrose had greater combined solubility than either alone, and the combination could be substituted for a part of the sucrose, increasing the total solubility so that supersaturation did not occur above 4°, thus controlling surface crustation.

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[Report of work in animal pathology and bacteriology] (*Idaho Sta. Bul. 192 (1932), pp. 23–26*).—The work referred to (E. S. R., 66, p. 269) includes data on eradication of infectious abortion, treatment for the sheep botfly larvae (E. S. R., 66, p. 273), foul sheath in sheep, treatment of subacute and chronic mastitis, bacillary white diarrhea studies, studies in udder infections, and the blood as an index of the health and body functions of the laying hen.

[Report of work in animal pathology] (*Kentucky Sta. Rpt. 1931, pt. 1, pp. 37–41*).—The work of the year (E. S. R., 66, p. 171) on the longevity of agar stab cultures of some pathogenic germs, streptococci, *Corynebacterium equi*, infectious abortion, bromothymol blue test for mastitis, glandular therapy, acidosis of pregnant ewes, and *Salmonella pullorum* is briefly reviewed.

[Report of work in animal pathology, bacteriology, and parasitology] (*Michigan Sta. Rpt. 1931, pp. 227, 228, 231–234, 236–239*).—Work in the section of animal pathology, conducted by E. T. Hallman and associates, as here referred to relates largely to the progress of infectious abortion studies, including herd control work, bacteriology and pathology of the bovine mammary gland, pathology of this infection in swine, nonvirulent vaccines, etc.

Work in animal bacteriology, reported upon by W. Giltner and his associates, includes data on the study of the immunizing value of Brucella-infected tissues by J. W. Scales; the determination of the immunizing value of a nonvirulent, nonagglutinable vaccine under way by D. B. Meyer; and a summary of the progress of the Brucella station projects by I. F. Huddleson. In reporting

upon work in parasitology W. L. Chandler records the identification of two forms infesting deer, the lungworm *Protostrongylus rufescens* (?) and larvae of the oestrid *Cephenomyia probifer*, and parasite control studies. Research work in avian pathology, reported upon by H. J. Stafseth, includes that with fowl pox, roup, pullorum disease, blackhead in turkeys, pasty eyes in ducklings, and bacteriological and pathological examinations.

Seventh report of the Government Institute for Veterinary Research ([*Chosen*] *Govt. Inst. Vet. Research Rpt., 7 (1932), Ger. abs., pp. 1–4, 6–8; Eng. abs., pp. 5, 9–12; pls. 3*).—The contributions presented in this report (E. S. R., 62, p. 260) are as follows: Studies of the Pathogenic Anaerobes—I, Detection of the Malignant Edema Organism by Agglutination (p. 1), II, The Agglutination Reaction of the Blackleg Organism and Its Relation to That of Malignant Edema (pp. 2, 3), by T. Konno and Y. Ochi; A Bacterial Species Associated with an Epidemic Disease of Guinea Pigs, by T. Konno and K. Hashimoto (p. 4); On the Comparisons of Virulency in Fluidal and Dried State of Smallpox Vaccine, by T. Matsumura (p. 5); A Mucinous Strain of *Bac*[*terium*] *abortus-equi*, by Y. Ochi (p. 6); Investigations of the Immune Isoreactions of the Blood of Chosen Cattle, I, by J. Nakamura (pp. 7, 8); Hemorrhagic Septicemia of Cattle in Chosen, by T. Fujii (p. 9); Studies on Pathological Anatomy of Hemorrhagic Septicemia of Cattle in Comparison with So-called "Hemorrhagic Disease" of Cattle in Chosen, I, by T. Kimura, T. Fujii, and K. Shimomura (p. 10); and Hematological Studies on Korean Ponies Infected with a Formosan Strain of *Trypanosoma evansi*, by S. Akazawa (pp. 11, 12).

Annual report of the Imperial Institute of Veterinary Research, Muktesar, for the year ending 31st March, 1931, F. Ware et al. (*Imp. Inst. Vet. Research, Muktesar* [*India*], *Ann. Rpt. 1930–31, pp. II+51*).—This annual report (E. S. R., 66, p. 371) includes a report of the veterinary research officer, H. Cooper, on work with infectious and parasitic diseases (pp. 13–33).

Live stock diseases report, No. 7, M. Henry (*N. S. Wales Dept. Agr., Live Stock Diseases Rpt., 7 (1930–31), pp. 23*).—This report (E. S. R., 66, p. 866) includes brief accounts of the occurrence of and control work with infectious diseases of livestock and the parasitic infestations, particularly cattle tick control. Brief reference is made to an outbreak of Newcastle disease, or pseudo-fowlpest, on the Victorian border, no extension of which into New South Wales took place.

The time element in removal of retained fetal membranes, C. F. Clark (*Jour. Amer. Vet. Med. Assoc., 81 (1932), No. 3, pp. 411, 412*).—In this contribution from the Michigan Experiment Station, the author reports that the removal from cattle of the retained fetal membranes in 48 hours or less after parturition resulted unfavorably in 18 per cent of the cases listed. Removal in 72 to 96 hours after parturition resulted unfavorably in 4 per cent of the cases listed.

Food poisoning due to toxic substances formed by strains of the cloacae-aerogenes group, R. Gilbert, M. B. Coleman, and A. B. Laviano (*Amer. Jour. Pub. Health, 22 (1932), No. 7, pp. 721–726, fig. 1*).—Attention is called to the fact that an increasing variety of bacterial species, including *B*[*acillus*] *cloacae*, *B. proteus*, and staphyloccocci, is being found to incite gastrointestinal disturbances following the consumption of food containing these microorganisms or their toxic products. An account is given of an outbreak of gastroenteritis, the data on which suggest that the etiological agent might have been introduced by means of eggs that had become contaminated.

The presence of lead in the herbage and soil of lands adjoining coke ovens, and the illness and poisoning of stock fed thereon, J. T. Dunn and H. C. L. Bloxam (*Jour. Soc. Chem. Indus., Trans., 51 (1932), No. 12, pp. 100T–*

102T).—The authors consider it evident that in the processes of the coke oven works in England lead and copper compounds are eliminated in sufficient amounts to poison the neighboring pastures.

Lead arsenate poisoning in chickens, E. F. Thomas and A. L. Shealy (*Jour. Agr. Research [U. S.], 45 (1932), No. 5, pp. 317–319*).—The demand for information regarding the possible poisoning of chickens by the lead arsenate spray used during the eradication campaign against the Mediterranean fruit fly led to the experiments at the Florida Experiment Station here reported.

It was found that the formula employed, namely, lead arsenate 8 lbs., brown sugar 50 lbs., sirup 10 gal., and water sufficient to make 200 gal., was apparently not harmful to chickens when consumed with feed and water continually for 60 days. It was apparent that a bird might consume as much as 13 grains of lead arsenate daily for 60 days without suffering any ill effects. It was found that while lead arsenate will produce death in chickens when fed in large quantities, there was no definite correlation between the weights of the birds and a lethal dose of lead arsenate.

Parasitology of man and the domestic animals, G. Alessandrini (*Parassitologia dell 'Uomo e degli Animali Domestici. Torino: Unione Tipog.-Editrice Torinese, 1929, pp. 574, figs. 413*).—The first part of this work (pp. 1–15) is devoted to a general discussion on parasitology. Part 2 (pp. 17–335) deals with the morphology and biology of animal parasites, part 3 (pp. 337–526) with the diseases caused by animal parasites, and part 4 (pp. 527–557) with parasitological technic.

Physical and chemical investigations of the virus of foot-and-mouth disease, I, II [trans. title] (*Ztschr. Immunitätsf. u. Expt. Ther., 68 (1930), No. 5–6, pp. 510–518, fig. 1; 75 (1932), No. 3–4, pp. 371–380*).—The first contribution, by K. Poppe and G. Busch, deals with the isoelectrical point and adsorption, and the second contribution, by Busch, with filtration and ultrafiltration.

Comparative studies of the nature of the grippe of man, influenza of the horse, and distemper of the dog [trans. title], E. Bemelmans (*Ergeb. Allg. Path. Mensch. u. Tiere, 26 (1932), pp. 612–710*).—The subject is considered in connection with a list of 345 references to the literature.

Incidence of sub-clinical mastitis, G. J. Hucker (*Amer. Jour. Pub. Health, 22 (1932), No. 7, pp. 710–714*).—In this contribution from the New York State Experiment Station the author concludes that "subclinical mastitis is relatively common and without careful laboratory control or veterinary inspection may remain undetected. Physical examinations, supported by autopsy observations, indicate that as high as 98 per cent of the quarters in certain herds may show fibrosis or induration. This condition probably signifies previous as well as present infection. In nearly one-half of all of the quarters studied streptococci could be demonstrated by cultural or microscopic methods, the percentages being greater in quarters showing fibrosis. Approximately one-fifth of the 221 cows autopsied showed pus pockets in the udder. The milk secured from these animals prior to autopsy gave no indication culturally, in more than one-half of the cases, that the udder might be abnormal."

An inapparent exanthematous fever provoked in man by Rhipicephalus sanguineus: Its virulence in the monkey and guinea pig [trans. title], J. Troisier and R. Cattan (*Ann. Inst. Pasteur, 47 (1931), No. 5, pp. 492–507, figs. 6*).—A more detailed account of the studies previously noted (E. S. R., 65, p. 871).

Studies on rinderpest, I–III [trans. title], H. Jacotot (*Ann. Inst. Pasteur, 48 (1932), Nos. 3, pp. 377–399; 5, pp. 648–675, figs. 4; 6, pp. 744–783, figs. 3*).—Part 1 deals with studies of the rinderpest virus, its tenacity and nature, and

with virus carriers. In part 2 the author reports on the protection afforded by antirinderpest serum and by virus-serum vaccination, and in part 3 on antirinderpest vaccination through use of extracts of the pulp of certain organs, devitalized by physical and chemical means. It is concluded that the virus-serum method of vaccination confers an immunity against rinderpest in French Indochina that lasts for a long period, probably for life, even when there is no visible reaction to such vaccination.

Progress report on dried rinderpest vaccine, M. M. Robles and J. D. Generoso (*Philippine Jour. Agr., 2 (1931), No. 4, pp. 341–345*).—In the authors' investigation (E. S. R., 66, p. 572), powdered rinderpest vaccine kept in the ice chest for 275 days indicated no loss of potency. This vaccine withstood an exposure of 30 days at room temperature without showing loss of immunizing value. Delayed drying appeared to be harmful to the immunizing value of the vaccine.

Experiments on the virulence of rinderpest blood, M. M. Robles (*Philippine Jour. Agr., 2 (1931), No. 4, pp. 307–314*).—In the experiments here reported most of the citrated rinderpest blood lost its virulence after 44 to 249 days, although some remained virulent from 111 to 249 days. "Citrated rinderpest blood kept for not more than 9 days in the ice chest (0 to 8° C.) remained fully virulent, as shown by the short average incubation period of from 3.1 to 3.3 days and by the marked lesions developed in the majority of the experimental animals used. On the other hand, blood kept in the ice chest for 12 days or more showed a diminished virulence as indicated by their long incubation period of from 3.4 to 4.9 days and the slight lesions developed in the majority of the experimental animals used. . . .

"Tests on blood exposed to room and incubator temperature proved that high temperature is destructive to virulence. At room temperature of from 24 to 32° rinderpest blood lost its infectivity after 9 to 11 days and at incubator temperature of 37.5° after 6 to 8 days. In some cases, however, blood exposed to room temperature remained virulent up to 15 days and at incubator temperature up to 8 days."

Classification of the species of Salmonella [trans. title], G. Pacheco (*Arch. Inst. Biol. [São Paulo], 2 (1929), pp. 209–217; Eng. abs., p. 216*).—In dealing with the classification of the forms of Salmonella, 19 in number, their action in carbohydrate media is brought together in tabular form.

Bovine salmonellosis in São Paulo, I–V, [trans. title] (*Arch. Inst. Biol. [São Paulo], 2 (1929), pp. 219–290, pls. 5*).—The several contributions here presented, all with English abstracts, are as follows: I, Clinical and Anatomopathological Aspects, by O. Stephan, A. Esquibel, and A. M. Penha (pp. 219–232); II, A Histopathological Study, by J. Montenegro (pp. 233–240); III, Bacteriological Studies, by G. Pacheco, A. M. Penha, C. Rodrigues, and O. Bier (pp. 241–272); and IV, Virus Carriers (pp. 273–278) and V, Persistence of Virus Carriers; Attempts at Sterilization by Vaccination (pp. 279–290), both by G. Pacheco and C. Neiva.

On the identification of Salmonella bovis with S. enteritidis [trans. title], G. Pacheco, A. Penha, C. Rodrigues, and O. Bier (*Compt. Rend. Soc. Biol. [Paris], 110 (1932), No. 24, pp. 857, 858*).—In the course of an epizootic among bovines the authors isolated a form of Salmonella thought to differ from *S. enteritidis*, to which the provisionary name *S. bovis* was given as above noted. A further study of the organism has led to the conclusion that it is a question of a single species, *S. bovis* being a synonym of *S. enteritidis*.

Schistosoma bovis and S. mattheei in Irak, with notes on the development of eggs of the S. haematobium pattern, C. MacHattie and C. R. Chadwick (*Roy. Soc. Trop. Med. and Hyg. Trans., 26 (1932), No. 2, pp. 147–156, pls.*

2).—*S. bovis* is here described from Iraq, where horses, donkeys, and mules have been found to be definitive hosts. The eggs of *S. bovis* in Iraq are never or only very rarely passed in the urine, and the pelvic and urinary structures are not pathologically involved in the infection, which is essentially portal and intestinal.

S. mattheei, as described by Veglia and Le Roux (E. S. R., 63, p. 171), is indistinguishable from *S. bovis* as the latter occurs in Iraq. Even in an area of intensive urinary schistosomiasis of man, the occurrence in cattle and sheep of eggs indistinguishable from those of *S. haematobium* does not justify the incrimination of these domestic animals as reservoirs of human infection.

The tuberculosis of animals [trans. title] (*Ergeb. Allg. Path. Mensch. u. Tiere, 26 (1932), pp. 711–876, figs. 15*).—In the first part (pp. 711–803) of this review of the subject The Tuberculosis of the Carnivora and of the Apes is dealt with by K. Nieberle, in connection with a list of 131 references to the literature. The Tuberculosis of the Fowl is then reviewed (pp. 804–876) by H. Zeller, accompanied by a list of 433 references to the literature.

Report of a special committee appointed by the People's League of Health Inc. to make a survey of tuberculosis of bovine origin in Great Britain (*London: People's League of Health, 1932, pp. XVII+44+[2]*).—The report of subcommittees A and B is presented by W. Hunter in four parts as follows: (1) The total bovine population of England and Wales on June 4, 1929, which was found to be 5,957,594 (pp. 1, 2); (2) the incidence of bovine tuberculosis in Great Britain (pp. 2–9); (3) evidence of presence of tubercle bacilli in milk (pp. 9–13); and (4) the incidence of tuberculosis of bovine origin in human beings (pp. 13–23).

In a study of all the available information on bovines sent to abattoirs, including those suspected of tuberculosis, it was found that 39.5 per cent contained gross macroscopic lesions of tuberculosis. It is estimated that on the basis of tuberculin reaction (1) at least 40 per cent of the cows in Great Britain are infected with the tubercle bacillus, though only a minority of them are in an infective condition; (2) about 0.2 per cent of all cows are suffering from tuberculosis of the udder, and are therefore probably excreting living tubercle bacilli in the milk; (3) about 40 per cent of the cows slaughtered in the public abattoirs show naked-eye lesions of tuberculosis; and (4) a proportion of the raw market milk, varying in different parts of the country from 2 to 13 per cent, with an average figure of 6.7 per cent, contains living tubercle bacilli. It is also estimated that (1) about 6 per cent of all deaths from tuberculosis are caused by the bovine type of bacillus; (2) about 2,000 deaths, mostly in children, occur annually from this cause; (3) at least 4,000 fresh cases of bovine infection develop each year; and (4) an immense amount of suffering, invalidity, and often deformity is caused by this bacillus.

A report of subcommittee C, by C. O. Hawthorne (pp. 24–36), deals mainly with the study of methods by which a milk supply free from the risk of infection by the tubercle bacillus can be secured.

The vaccination of the bovine against tuberculosis by B. C. G. [trans. title], F. Gerlach (*Ann. Inst. Pasteur, 47 (1931), No. 5, pp. 475–483*).—The author concludes that the vaccination of bovines against tuberculosis by the use of B. C. G. is inoffensive and immunizes sufficiently to recommend its application on a large scale.

New investigations of the B. C. G. vaccination of bovines against tuberculosis [trans. title], O. Bang, I. Jundell, and H. Magnusson (*Ann. Inst. Pasteur, 47 (1931), No. 4, pp. 386–407*).—Experiments here reported, conducted in part by Bang in Denmark and in part by the junior authors in Sweden, are considered to demonstrate that calves vaccinated subcutaneously generally ac-

quire considerable immunity. Of the control calves 100 per cent were susceptible to intravenous infection as compared with 54 per cent of those vaccinated.

Experiments on the action of B. C. G. on swine [trans. title], I. JUNDELL and H. MAGNUSSON (*Ann. Inst. Pasteur, 47 (1931), No. 4, pp. 408–428, fig. 1*).—While in their work with calves, noted on page 379, the authors found B. C. G. to furnish a certain measure of protection against a subcutaneous inoculation of virulent tubercle bacilli, they have not found B. C. G. when thus administered to pigs to confer any protection.

Phagocytosis of Brucella, an index of immunity to undulant fever in man, I. F. HUDDLESON and H. W. JOHNSON (*Science, 74 (1931), No. 1917, pp. 315, 316*).—In studies at the Michigan Experiment Station of the phagocytic activity of the polymorphonuclear cells in the blood of man toward the genus Brucella, an important relation between this phenomenon and susceptibility and immunity toward undulant fever has been revealed. It was found that the cells of individuals who have never knowingly been in contact with Brucella infective materials or who have not had undulant fever possess little if any phagocytic activity for the organism when mixed with it in vitro. On the other hand, the polymorphonuclear cells of those who have handled infective materials, such as cultures or infective tissues, and of those who have recovered from undulant fever have marked phagocytic activity. The study of many such cases has shown that from 80 to 100 per cent of these particular cells will ingest Brucella to a marked degree.

The isolation of Brucella abortus from tonsils, C. M. CARPENTER and R. A. BOAK (*Jour. Amer. Med. Assoc., 99 (1932), No. 4, pp. 296–298*).—The authors report upon the isolation of *B. abortus* from 8 of 56 pairs of tonsils examined in New York State.

Melitensis meningo-encephalitis: Mycotic aneurysm due to Brucella melitensis var. porcine, G. H. HANSMANN and J. R. SCHENKEN (*Amer. Jour. Path., 8 (1932), No. 4, pp. 435–444, pls. 4*).—A case of meningo-encephalitis is reported, with a review of the related literature, a mycotic aneurism due to the porcine variety of *B. melitensis* having been the immediate cause of death.

The occurrence of Brucella agglutinins in cattle in the Panama Canal Zone, E. O. JORDAN and J. MCBROOM (*Jour. Amer. Vet. Med. Assoc., 81 (1932), No. 3, pp. 401–404*).—The authors have found by application of the agglutination test that *B. abortus* infection is present in dairy cattle in the Panama Canal Zone, although apparently to a somewhat less degree than in many parts of the United States.

The incidence of Bang abortion disease in tuberculous cattle, W. M. THOMSON (*Jour. Amer. Vet. Med. Assoc., 81 (1932), No. 3, pp. 348–351*).—The author has found that infection with *Brucella abortus* and tuberculosis in the same individual may be a rather common occurrence in areas where bovine tuberculosis has not as yet been eradicated.

Posterior paralysis due to a fractured vertebra, C. F. CLARK and L. B. SHOLL (*Jour. Amer. Vet. Med. Assoc., 81 (1932), No. 3, pp. 410, 411, fig. 1*).—This is a case report on a Holstein heifer, contributed from the Michigan Experiment Station.

An atypical case of hemorrhagic septicemia in the carabao, T. TOPACIO (*Philippine Jour. Agr., 2 (1931), No. 4, pp. 277–280*).—A case history is presented with a view to illustrating the difficulty in diagnosing hemorrhagic septicemia in cattle or carabaos by the clinical symptoms.

Parturient paresis, or milk fever, in goats, A. J. DURANT (*Jour. Amer. Vet. Med. Assoc., 81 (1932), No. 4, pp. 551–553, fig. 1*).—In this contribution from the Missouri Experiment Station the author gives a case report of milk fever in a high-bred, heavy-producing goat. This is thought to be the first in this animal to be recorded in literature.

Mastitis in ewes, caused by infection with a Pasteurella, H. Marsh (*Jour. Amer. Vet. Med. Assoc., 81 (1932), No. 3, pp. 376–382, figs. 3*).—Contributing from the Montana Experiment Station, the author reports having found mastitis to occur quite frequently in range sheep in August and September, when the lambs are three or four months old. It is characterized by a sudden onset with high fever and acute inflammation of one side of the udder. In some cases death results, while in the majority of cases the udder abscesses and the ewe recovers, but the udder is permanently spoiled. This type of mastitis was found to be a specific infectious disease caused by a Pasteurella. No successful treatment has thus far been developed, although it is pointed out that successful immunization with a bacterin has been reported in Germany.

Paratuberculous enteritis in sheep caused by an acid-fast organism, J. A. Howarth (*Jour. Amer. Vet. Med. Assoc., 81 (1932), No. 3, pp. 383–387, figs. 5*).—A disease of aged sheep resembling Johne's disease of cattle was observed in a band consisting of 2,000 head in the Sacramento Valley of California. The clinical manifestations of this ailment include a general emaciation, unthriftiness, tucked-up abdomen, intermittent diarrhea, and occasionally an elevation of temperature. Sheep affected with the disease survive for long periods, some improving at times only to have relapses later. The affection is easily confused with a heavy parasitic infestation, especially when observed in the field. On the ranch where the disease has appeared the loss has been approximately 20 to 30 head each year for the past seven years. Smears made from deep scrapings of the affected parts of the intestinal mucosa and stained by the alcoholic acid-fast method showed great clusters of small, acid-fast bacilli. Smears made in the same manner from a great number of the mesenteric lymph glands also showed acid-fast bacilli.

The symptoms, the lesions, and the finding of acid-fast organisms indicate that this affection may be Johne's disease. Affected sheep gave a better reaction to avian tuberculin than to johnin.

Control measures for parasites of sheep and swine, B. Schwartz (*Vet. Alumni Quart. [Ohio State Univ.], 20 (1932), No. 2, pp. 65–70*).—This is a practical summary.

Statistical observations involving weight, hemoglobin, and the proportion of white blood cells in pigs, W. A. Craft and L. H. Moe (*Jour. Amer. Vet. Med. Assoc., 81 (1932), No. 3, pp. 405–407*).—This is a report of observations of pigs made in the course of experimental studies at the Oklahoma Experiment Station in 1931, the details of which are presented in tabular form.

Leucocyte counts on the blood of normal, cholera-infected and recently immunized pigs, C. G. Cole (*Jour. Amer. Vet. Med. Assoc., 81 (1932), No. 3, pp. 392–400*).—This is a report of a study of the effect of the simultaneous treatment for hog cholera on the white blood cells of pigs, with a view to obtaining more data on the white cell count of normal and cholera-infected animals. In a group of 28 simultaneously treated pigs there was observed in all cases a distinct, although apparently transitory decrease in the number of white blood cells (leucopenia) following this treatment. It appeared also that the severity of the leucopenia was in a measure related to the dose of serum, the leucopenia being more marked in the pigs receiving the lower dosage.

Unusual lesions in swine brucelliasis, W. A. James, F. Thorp, jr., and R. Graham (*Ill. State Acad. Sci. Trans., 24 (1931), No. 2, pp. 441–443, figs. 4*).—The authors' observation shows that arthritis and osteomyelitis in swine may cause marked symptoms of lameness and stiffness. It is pointed out that these inflammatory pyogenic bone lesions with multiple necrotic foci in the epiphysis

of the long bones harboring *Brucella suis* suggest the possible significance of this bacterial infection in a new rôle, distinct from invasion of the reproductive organs.

Precipitation test in swine erysipelas diagnosis, F. Breed (*North Amer. Vet., 13 (1932), No. 8, pp. 28–30*).—The author concludes that the precipitin test for the determination of the presence or absence of *Bacillus erysipelatis suis* has been employed on a sufficient number of cases to justify its adoption as routine for a quick and definite diagnosis.

Studies in infectious enteritis of swine.—VI, Immunity in swine coccidiosis, H. E. Biester and L. H. Schwarte (*Jour. Amer. Vet. Med. Assoc., 81 (1932), No. 3, pp. 358–375, figs. 5*).—In this further contribution (E. S. R., 63, p. 774), the authors report that "experimental coccidial infections in swine followed a definite course, resulting in a characteristic curve of oocyst elimination after a prepatent period of about seven days. One experimental feeding produced varying degrees of partial resistance to later infections but did not result in an absolute immunity, nor was it possible to produce an absolute immunity by feeding massive doses of sporulated oocysts on one or two successive days. The administration of infective forms following recovery from previous infections caused by one or two feedings resulted in the production of increased resistance to subsequent infections, provided the intervals between infections were of short duration. Such partial immunity, acquired as a result of an infection, decreased with the lapse of time.

"A complete immunity was produced by the daily administration of infective forms. The immunity produced in this manner was not permanent. Following rest periods of 18 days or longer, it was again possible to infect those pigs which had been fully immune previous to the rest period."

The kidney worm of pigs, F. H. S. Roberts (*Brisbane: Queensland Dept. Agr. and Stock, 1931, pp. 12, pls. 3*).—This is a summary of information on the kidney worm of pigs (*Stephanurus dentatus*), which occurs in Queensland wherever pigs are raised.

Infection of pigs and other animals with kidney worms, Stephanurus dentatus, following ingestion of larvae, B. Schwartz and E. W. Price (*Jour. Amer. Vet. Med. Assoc., 81 (1932), No. 3, pp. 325–347*).—The authors here present and discuss protocols dealing with the course of experimental infections of pigs and other animals to which the larvae of *S. dentatus* were administered by mouth.

Following experimental feeding of infective larvae to pigs, the worms were distributed by the circulation to various organs and tissues and became localized principally in the portal vein and in its branches, the periportal tissue, the gastrohepatic artery, the hepatic tissue, and the lungs. The perirenal fat, the ureters and kidneys, and the psoas muscles became infested relatively late in the course of the life cycle of the parasites.

Relation of the dog to public health, M. Joannides (*Ill. State Acad. Sci. Trans., 24 (1931), No. 2, pp. 444–459*).—This is a review of the diseases and parasites of the dog and their relation to man.

Controlling the brown dog tick, U. E. Marney (*North Amer. Vet., 13 (1932), No. 8, pp. 22–24*).—In testing the resistance of the brown dog tick, it was found that water raised to a temperature not over 175° F. was fatal to the tick. Kerosene extract of pyrethrum in concentration was ineffective until a period of 4 minutes had elapsed. Kerosene emulsion at a strength of 1 to 7 proved fatal in 2 minutes, and proved to be the most efficient of any dip used for dipping infested dogs. A 1 per cent rotenone powder when dusted on an infested animal killed the parasites within 24 hours and prevented reinfestation for 10 days or longer.

Notes on investigations into some poultry diseases, T. Dalling and G. H. Warrack ([*Beckenham, Eng.: Wellcome Physiol. Research Labs., 1932*], *pp. 11*).—Brief notes are given on investigations of the year, with the results obtained with pullorum disease, fowl pox, coccidiosis, fowl paralysis, and some diseases observed in the course of routine post-mortem examinations.

Studies of the Egyptian fowl pest [trans. title], E. Lagrange (*Ann. Inst. Pasteur, 48 (1932), No. 2, pp. 208–267, figs. 3*).—This is a report of studies of Egyptian fowl pest, a distinct type of fowl pest, conducted in continuation of those previously noted (E. S. R., 61, p. 572), and presented in connection with a list of 34 references to the literature.

Results with pigeon-pox virus for the immunization of fowls against chicken-pox, S. T. Michael (*Jour. Amer. Vet. Med. Assoc., 81 (1932), No 3, pp. 319–324, fig. 1*).—A pigeon pox virus obtained from the Ministry of Agriculture in England was applied in the form of fresh lesion tissue and desiccated scabs suspended in glycerin and physiological salt solution in the vaccination of fowls by the feather follicle infection method. Reactions resembling mild fowl pox lesions were produced on the combs and in the follicles, but no increased resistance to artificial or natural exposure to fowl pox virus could be demonstrated.

Infection and vaccination of fowls by ingestion with the Pasteurella of fowl cholera [trans. title], A. Urbain and P. Goret (*Ann. Inst. Pasteur, 48 (1932), No. 4, pp. 470–475*).—In experiments conducted the authors have found that fowls readily become infected in the great majority of cases through ingestion of the avian Pasteurella. Through use of cultures of the fowl cholera organism attenuated by heat and also with living cultures of the bovine Pasteurella avirulent for the fowl, the authors have successfully vaccinated some of the fowls against cholera by ingestion. Although the fowls thus vaccinated were resistant to an ingested virulent culture that killed control birds, they succumbed when inoculated intramuscularly.

The practical use of the fresh blood agglutination test for pullorum disease [trans. title], Peters (*Tierärztl. Rundschau, 37 (1931), No. 8, pp. 126, 127*).—In a comparison of the fresh blood with the tube test as a standard for pullorum disease, it was found to be 95.35 per cent accurate.

Can grown fowls be infected with pullorum disease? [trans. title], Lerche (*Tierärztl. Rundschau, 37 (1931), No. 29, pp. 511–513*).—In experiments with 15 hens and a cock the author has found infection to spread from affected to healthy birds, apparently depending upon the presence of virus spreaders among the positive reacting hens. It is pointed out that the percentage of infection spreaders appears to be very small, *Salmonella gallinarum* having been found by J. Hof [3] in the oviduct or cloaca of only 13 of 400 positive reacting hens.

The internal parasites of poultry, E. A. Bruce (*Canada Dept. Agr. Bul. 158, n. ser. (1932), pp. 12, figs. 2*).—A practical account of the more important parasitic diseases of poultry.

The effect of different poisons on fowls: A contribution to comparative pharmacology [trans. title], L. Forchheimer (*Tierärztl. Rundschau, 37 (1931), Nos. 24, pp. 423–426; 26, pp. 459–461; 27, pp. 477–480; 32, pp. 569, 570; 34, pp. 606, 607; 35, pp. 624–626*).—This is a report of 22 different toxic preparations in which the susceptibility of birds was found to differ from that of man.

Duck sickness not contagious, E. R. Kalmbach (*Amer. Game, 21 (1932), No. 3, pp. 43, 50, fig. 1*).—This contribution supplements the earlier accounts by the author (E. S. R., 67, p. 322). The finding of the presence of botulinum toxins in the blood stream of afflicted birds is considered conclusive evidence that botulism is the cause.

[3] Közlem. Összehasonl. Élet és Kórtan Köréből, 21 (1928), No. 9–12, pp. 324–334.

AGRICULTURAL ENGINEERING

[Agricultural engineering investigations at the Idaho Station] (*Idaho Sta. Bul. 192 (1932), pp. 16–19*).—The progress results of investigations on irrigation and drainage, the combining of field peas, tests of electric water heaters and brooders, and methods of framing joints in farm buildings are briefly summarized.

[Agricultural engineering investigations at the Michigan Station], H. H. MUSSELMAN (*Michigan Sta. Rpt. 1931, pp. 243–245*).—The progress results of investigations on combines for threshing beans, haymaking, mechanical ventilation, an electric burglar alarm for poultry houses, and supplemental irrigation are briefly summarized.

[Agricultural engineering investigations at the Mississippi Station], T. N. JONES (*Mississippi Sta. Rpt. 1932, pp. 7–10*).—The progress results are reported of studies on the physiology and mechanics of weed control on cotton soils, hay curing by natural means, and the crushing of alfalfa and Johnson grass in connection with curing.

Mechanization and British agriculture ([*Rothamsted Expt. Sta., Harpenden*], *Rothamsted Confs. No. 14 (1932), pp. 55*).—This is the report of a conference held at the Rothamsted Experimental Station. It contains special papers and addresses on The Effect of Mechanization on Soil Fertility, by E. J. Russell (pp. 7–16); Engineering Developments and Possibilities, by J. E. Newman (pp. 17–25); Combination of Live Stock with Systems of Mechanized Farming, by J. A. S. Watson (pp. 26–30); and Summary of the Agricultural Problems Involved, by H. G. Miller (pp. 51–55).

Contributions to the hydrology of the United States, 1931 (*U. S. Geol. Survey, Water-Supply Paper 638 (1932), pp. V+162, pls. 25, figs. 19*).—This report contains two papers previously noted (E. S. R., 65, p. 879; 68, p. 254); Outline of Methods for Estimating Ground-Water Supplies, by O. E. Meinzer (pp. 99–144); and Quality of Water of the Colorado River in 1928–1930, by C. S. Howard (pp. 145–158), a continuation of earlier work (E. S. R., 63, p. 78).

Surface water supply of the United States, 1930, Part 5 (*U. S. Geol. Survey, Water-Supply Paper 700 (1932), pp. V+149, fig. 1*).—This report, prepared in cooperation with the States of Minnesota, North Dakota, Wisconsin, Illinois, and Missouri, presents the measurements of flow made on streams in the Hudson Bay and upper Mississippi River basins during the year ended September 30, 1930.

Surface water supply of the United States, 1931, Part 10 (*U. S. Geol. Survey, Water-Supply Paper 720 (1932), pp. V+99, fig. 1*).—This report, prepared in cooperation with the States of California, Nevada, Oregon, Utah, and Wyoming, presents the measurements of flow made on streams in the Great Basin during the year ended September 30, 1931.

Geology and ground-water resources of The Dalles region, Oregon, A. M. PIPER (*U. S. Geol. Survey, Water-Supply Paper 659–B (1932), pp. IV+107–189, pls. 9, figs. 3*).—This report is based upon an investigation conducted in cooperation with the Oregon Experiment Station to determine the feasibility of pumping water from wells for irrigating orchard and produce tracts in the vicinity of The Dalles, Oreg.

The data indicate that there are two possible sources of ground water for irrigating the existing orchards, the upper and lower water-bearing zones of the Yakima basalt. The existing truck gardens can be irrigated from wells of moderate capacity in the alluvium or from wells of larger capacity drawing from the lower water-bearing zone of the basalt. The Dalles formation gener-

ally has so small a water-yielding capacity that it is not a feasible source of water for irrigation. The water in the upper water-bearing zone of the basalt has a much higher head than that in the deeper zone and can be raised to a large part of the existing orchards by lifts between 150 and 450 ft.

The flow of water through groups of sluices: Experiments on scale models, with particular reference to the effects of mutual interference, H. ADDISON (*Inst. Civ. Engin.* [*London*], *Select. Engin. Papers, No. 105* (*1931*), *pp. 48, figs. 15*).—Laboratory experiments on scale models to investigate the effect of mutual interference between adjacent sluices of a group are reported, as conducted at the Royal Egyptian School of Engineering at Giza.

Three models in all were tested, the first having 4 vents 20 cm wide, the second 4 vents 10 cm wide, and the third 3 vents 10 cm wide. The first two were geometrically similar in all respects. In all the models the general proportions of the vents, piers, and gates were reproduced from drawings of the Assiut Barrage and Ibrahimia Canal Head Regulator. Each series of experiments consisted of an average of six or eight sets of observations under conditions of uniform discharge as nearly as could be managed, alterations being made only in the downstream water level, which was adjusted by the outlet door at the tail of the escape channel. The arrangements of the models included (1) gates lifted clear of water, (2) water flowing over top of gates, (3) water flowing between lower gates and floor, and (4) water flowing between upper and lower gates.

The results in general show that in the particular kind of submerged orifice experimented on, the over-all loss of head, under given conditions, consists of a fixed quantity diminished by an amount representing recovery of head, which is itself a function of the ratio $\frac{\text{area of gate-opening}}{\text{area of channel}}$. They also show that the most convenient arrangement of the gates is either (3) or (4) above, in which the height of the lower gates is small compared with their width.

It was found that, in general, as the downstream level rose, the surface flow progressively altered from a rapid flow in a downstream direction to a state of complete quiescence and, finally, in many cases to a brisk upstream movement into the vents, proceeding from eddies which rose to the surface about half way between the regulator and the downstream gauge point. With water flowing between the gates, a very pronounced stationary wave, having a height of perhaps a quarter of its length, completely filled each vent at low downstream levels and high rates of flow, and only subsided when the upstream water level had reached nearly to the top of the piers.

Closing any of the vents either reduced the discharge through each of the remaining vents for a given difference of level upstream and downstream or increased the drop in head through the regulator for a given discharge per vent. The larger the number of vents closed the more pronounced was the effect on discharge or levels. The effects did not depend materially on the relative position of the open and closed vents, i. e., closing the two outer vents of a group of four had sensibly the same effect as closing the two inner ones, but closing the end one alone of four did have less effect than closing an intermediate vent.

If the downstream water level was high enough to influence the flow at all, interference operated downstream of the gates as well as upstream, and the greater the recovery of head downstream with all vents open the greater was the extent of downstream interference. Upstream interference depended in amount upon the ratio of height of gate-opening, or head over gates, to a depth of water around upstream pierheads and can therefore be attributed to cross

currents set up in the attempt of water from the whole width of the approach channel to enter the remaining open vents.

In those circumstances where upstream interference normally occurs it seems probable that both the shape of the upstream noses of the piers and the distance of the plane of the gates downstream from the pierheads will have some influence. If, for instance, the noses are of cutwater form instead of being semicircular, as in these experiments, more contraction and thus more interference would be expected, while bringing the gates further upstream should lessen interference.

Fifteenth Census of the United States, 1930: Drainage of agricultural lands—summary for the United States, 1929 and 1930 (*Washington: U. S. Bur. of the Census, 1932, pp. 32, map 1*).—This summary presents some of the statistics relating to the drainage of lands for agricultural purposes in the 35 States for which organized enterprises were reported.

It indicates that nearly two-thirds of the lands in drainage enterprises in the United States are located north of the Ohio and Missouri Rivers. The lands of this section, excepting large swampy areas in Wisconsin and northern Minnesota, were generally in farms before drainage enterprises were organized. The data also show 67,927 drainage enterprises for the United States with an average area of 1,892 acres. There are 66 such enterprises of 100,000 acres or more, 4,273 of between 5,000 and 100,000 acres, 32,532 of between 500 and 5,000 acres, and 31,056 of less than 500 acres.

According to the classifications there were 4,213 drainage districts, 62,707 county drains, 212 township drains, 41 State projects, 68 irrigation enterprises, 26 commercial developments, 655 individually owned projects, and 5 projects of undetermined character within the 35 drainage States.

The works completed to January 1, 1930, included 138,673 miles of ditches, 55,032 miles of tile drains, 6,540 miles of levees, and 444 drainage wells from which water was pumped in order to lower the water table and prevent damage from seepage and alkali.

Cost of pumping for drainage in the upper Mississippi Valley, J. G. Sutton (*U. S. Dept. Agr., Tech. Bul. 327 (1932), pp. 100, figs. 16*).—This report presents detailed data on the operation and cost of 17 typical drainage pumping plants in Illinois, Iowa, and Missouri, based on a study extending over a period of six years and a comparison of a total of 70 plant years of records (E. S. R., 67, p. 607).

The districts having no gravity drainage pumped an average yearly run-off of from 13 to 40 in. depth over the watershed area. Several districts were affected by backwater from dams to such an extent that the river level was from 6 to 8 ft. above the level of the water in the districts at normal low-water stage. It was found that such districts pumped almost double the quantity of water pumped by similar districts not affected by dams.

Under conditions obtaining at the time these studies were concluded, electric and oil-engine power are the most economical types to use. At about 15 per cent plant factor the average total cost of pumping by the oil-engine group of plants was 2.2 cts. per brake horsepower hour, and by the electric plants 2.7 cts. At slightly higher plant factor the average cost for the steam group was 2.9 cts. per brake horsepower hour. Below about 12 per cent plant factor the cost of pumping with the electric plants generally was less than with the oil-engine plants, and above 12 per cent plant factor generally was more.

The average costs per acre-foot pumped were 69 cts. for the oil-engine group and 77 cts. for the electric group, at approximately 10 ft. average lift and only slightly different plant factors. The cost for the steam plants was only 55 cts.

per acre-foot at a static lift of about 7 ft., but no new plants have been built since 1920 and this is much less than could be obtained with similar plants built at prices current during the past decade.

The average annual costs per acre of watershed were $1.13 for the oil-engine group, including the costs of the steam stand-by units, and $1.40 per acre for the electric plants. Part of this difference was due, however, to the difference in the amounts of run-off pumped, which were 15.07 in. by the oil-engine group and 21.75 in. by the electric group. For the all-steam group, pumping 24.74 in. of run-off, the cost per acre of watershed was only $1.06, reflecting the low cost per acre-foot pumped.

The average annual costs per acre assessed, for the plants studied, were $1.84 for the electric group, $1.48 for the oil-engine group, and $1.96 for the steam group. This cost bears no definite relation to any other unit cost except that it is larger than the cost per acre of watershed. Fixed charges constituted 45 per cent of the total cost of pumping with oil engine and 33 per cent with electric power. This fact emphasizes the greater importance of economy in first cost for oil-engine plants than for electric plants.

Fuel and lubricants have constituted 23 per cent of the cost of pumping with the oil-engine plants, while current has constituted 53 per cent with the electric plants. This comparison emphasized the special importance in the latter type of an advantageous power rate and of efficiency in both design and operation of the whole plant.

The difference in labor costs, which were 19 per cent for oil-engine plants and 7 per cent for electric plants, are largely inherent in the types of equipment. The same is true concerning difference in costs for repairs and supplies, which were 6 per cent and 2 per cent for the respective power types. The miscellaneous and overhead expenses amounted to 7 per cent for the oil-engine plants and 5 per cent for the electric plants.

Ditch cleaning experiments in Delaware, W. D. Ellison (*Agr. Engin., 13 (1932), No. 8, pp. 195–198, figs. 4*).—A contribution from the U. S. D. A. Bureau of Agricultural Engineering gives a brief outline of ditch maintenance work being done in Delaware in cooperation with the State highway department. Cost data are included, and machinery available for maintenance is discussed.

It has been found that the performance of ditch maintenance work by hand labor is more costly than by other methods in most instances. Dredging and blasting methods have shown promise, and excavators with high traction speeds appear desirable.

The dynamic properties of soil, III, IV, (*Agr. Engin., 13 (1932), Nos. 8, pp. 201–204, figs. 7; 11, pp. 279–285, figs. 13*).—These are the third and fourth contributions to the subject from the Alabama Experiment Station (E. S. R., 66, p. 378).

III. *Shear values of uncemented soils,* M. L. Nichols.—The results of studies of the amount of force necessary to produce shear by tillage machinery in various uncemented soils are reported. The general nature of the reactions involved also were determined in over 1,500 tests.

It was found that the shear value of any plastic soil is proportional to pressure. The maximum shear value of any plastic soil is proportional to the plasticity number. The maximum shear occurred at a moisture content approximating that of the lower plastic limit, and decreased from this point to a point near the upper plastic limit. The relation of increasing and decreasing shear to moisture content was found to be linear. These relationships were evaluated for a series of plastic soils, and are suggested as a basis for calculating the shear values of other plastic soils by means of formulas and diagrams.

Shear values of nonplastic soils were also studied, and the reaction was found to be similar to that of plastic soils when the soil contained appreciable amounts of colloidal material. Pure sand showed no appreciable increase in shear value with increased moisture content. The shear value of the nonplastic soils seemed to depend to a large degree upon the size, shape, and smoothness of the coarse particles, and therefore could not be approximated with the same degree of accuracy as the shear value of plastic soils which take these properties from a predominant quantity of very small and comparatively uniform particles.

Formulas derived from the soils studied for approximating the moisture content of maximum reaction and maximum shear value based upon the colloidal content are included as the best available material for estimating the shear value of a nonplastic soil.

IV. *A method of analysis of plow moldboard design based upon dynamic properties of soil*, M. L. Nichols and T. H. Kummer.—The reactive properties of soil to moldboard curvatures were studied (1) by observation of plows in the field, (2) by observation of small plows run in the laboratory in glass-sided boxes containing various soils in different conditions, and (3) by measurement of the reaction of soils to various chisel shapes approximating sections of a moldboard. Studies were also made of moldboards by two sets of perpendicular differential sections, one parallel with and the other at right angles to the land side, and then by spiral differential sections. It was found that the kind and degree of curvature could be explained by means of the soil reaction data and the entire surface expressed by simple mathematical formulas. The paper includes a discussion of the general principles of design, a method of measuring and expressing moldboard shapes mathematically, and the general relationship of these curvatures to the dynamic properties of the soil.

In general, all moldboards were found to be functionally divided into three sections, as (1) the lower or share portion, forming a wedge for breaking the soil loose; (2) a central pulverization area; and (3) a turning and inversion area on the upper part of the moldboard.

It was found that the entire surfaces of all plows studied could be described by arcs of circles moving along and rotating on or directly above the line of travel of the tip of the wing. Some plows required two arcs, others required only one to describe the surface. A mechanism was devised for measuring the angle (ϕ) of the plane of the arc and the line of travel, the angle (θ) produced by the elevation of the free end of the chord of the arc, and (t) the distance of travel. The entire surface was described by parametric equations giving the relationships of ϕ, θ, and t, which are expressed by the general formula θ or $\phi=ce^{kt}$, where e is the base of natural logarithms.

It was found that the perpendicular differential sections of the pulverization area for all plows studied could be expressed by the type formula $z=ae^{bx}$, where z and x are the coordinates of the curve and a and b are constants. The relationship between the shape of the perpendicular differential sections and the method of describing the plow surfaces by moving the area is explained.

The turning of the furrow slice was found to be accomplished by spiral easement or uniform-pressure curves. Projections of the path of soil particles were found to be sections of logarithmic or equiangular spirals of the general formula $R=ae^{m\omega}$, where R is the radius, ω the angle through which the radius has turned, and a and m constants. The banking or superelevation of this spiral was found to be proportional to the turning; that is $\theta=\rho e^{kt}$, where ρ and k are constants.

The mechanical principles of pulverization, turning, and inversion by uniform pressure surfaces whose sections have the above formulas are suggested as a basis for design of plows. Variation of the constants in the formulas would

enable the principles to be adapted to different soil conditions and speeds of plowing. A number of variations of the application of the principles are pointed out from a study of different plows.

The effect of the degree of slope on run-off and soil erosion, F. L. Duley and O. E. Hays (*Jour. Agr. Research [U. S.], 45 (1932), No. 6, pp. 349–360, figs. 6*).—Studies conducted at the Kansas Experiment Station are reported in which determinations of run-off and erosion were made by means of water applied to soil artificially to simulate rainfall. In one case a tank, which could be tilted so as to vary the degree of slope of the surface, was filled with soil and used to study the effect of slope on run-off and erosion. In another test the plats were placed at different angles on a hillside so that the slope ranged from level to that of the steepest part of the hill. By properly locating the plats large variations in soil profile could be avoided.

The results from the two methods checked very well and indicate that the one to be used will depend on the type of problem to be studied. The run-off was found to increase rapidly as the slope increased from 0 to about 3 per cent grade. The increase in run-off was then very slight for each per cent of increase in slope. The soil eroded increased very gradually until the slope was about 4 per cent, then the increase was found to be more rapid up to about 7 or 8 per cent, after which there was a still greater increase in the rate at which the soil was removed from the plats.

The amount of run-off water required to erode 1 lb. of soil decreased rapidly as the slope increased from 1 per cent up to about 10 per cent, after which the decrease was gradual and slight. In some cases the water required to erode 1 lb. of soil was less for the 0 and 1 per cent slopes than for a 2 per cent slope.

Soil erosiveness is shown to depend not merely on the physical properties of the soil, but also on the degree of slope and possibly on several other factors. A silty clay loam gave greater erosion on the lower slopes, whereas a sandy soil gave more erosion than did the silty clay loam on steep slopes. The results obtained on large plats in Missouri and Texas have been shown to correspond reasonably well with the results obtained in these tests. This would tend to indicate that small plats having water applied artificially may be used for studying a large number of problems in connection with soil erosion.

Soil erosion in California: Its prevention and control, W. W. Weir (*California Sta. Bul. 538 (1932), pp. 45, figs. 40*).—This well-illustrated bulletin describes prevailing conditions of soil erosion in California and presents practical information on control with particular reference to terracing, contour cultivation, strip cropping, underdrainage, and the use of soil-saving dams.

Efficiency of terracing machines, J. C. Wooley (*Agr. Engin., 13 (1932), No. 7, pp. 182, 183, figs. 2*).—Tests of four terracing machines at the Missouri Experiment Station are reported briefly. It was found that efficiency ratings in terms of work units of the movement of 1 cu. ft. of earth 1 ft. laterally for each forward foot of motion decreased as the angle of lift increased.

Public Roads, [October, 1932] (*U. S. Dept. Agr., Public Roads, 13 (1932), No. 8, pp. 121–136+[2], figs. 16*).—This number of this periodical contains the current status of Federal-aid road construction as of September 30, 1932, and the following articles: Research on the Atterberg Limits of Soils, by A. Casagrande (pp. 121–130, 136); The New Hampshire Traffic Survey, by L. E. Peabody (pp. 131–136); and Cement Concrete Gives Good Service on Connecticut Avenue Experimental Road (p. 136).

Moisture content of wood in dwellings, E. C. Peck (*U. S. Dept. Agr. Circ. 239 (1932), pp. 24, pl. 1, figs. 17*).—This publication furnishes definite recommendations for the prevention of moisture changes in wood, which are based on a study by the Forest Products Laboratory, in cooperation with the National

Lumber Manufacturers' Association, the Western Pine Manufacturers' Association, and the Southern Forest Experiment Station, of the moisture content of wood in service in dwelling houses in various regions throughout the United States.

The data indicate that for any individual piece of interior-finishing woodwork to be used in dwellings in most parts of the United States the moisture content at the time of installation should be between 5 and 10 per cent of the weight of the oven-dry wood. In the damp southern coastal regions where the humidity is high it should be between 8 and 13 per cent, and for the dry southwestern region where the humidity is low it should be between 4 and 9 per cent. For sheathing, framing, siding, and exterior trim to be used in dwellings in most parts of the United States the moisture content of any individual piece at the time of installation should be between 9 and 14 per cent of the weight of the oven-dry wood, and in the dry southwestern regions between 7 and 12 per cent.

In so far as is practicable wood should be protected against extreme changes in atmospheric humidity or direct contact with water during and after manufacture.

Tests on tin-base and lead-base bearing metals, C. JAKEMAN and G. BARR (*Engineering [London], 133 (1932), No. 3448, pp. 200–202, figs. 6*).—Studies are reported which indicated that an alkali metal-lead alloy will run satisfactorily at moderate loads and temperatures when lubricated with mineral oil or compounded oil, but that the alloy freely dissolves in olive or sperm oils. The general conclusions drawn from the whole investigation are that neither high-lead nor high-tin alloys are readily attacked by the lubricants in common use, such as mineral oil, compounded mineral oil, and castor oil, but that generally speaking a higher friction loss will occur with a high-lead alloy than with a high-tin alloy.

Steel in the construction of farm machinery, especially grain cleaners and wagons [trans. title], K. KERMANN (*Fortschr. Landw., 7 (1932), No. 16, pp. 409–413, figs. 6*).—A brief summary of information from various sources is given on the use of steel parts in German agricultural machinery, especially grain cleaners and wagons.

Field curing of hay as influenced by plant physiological reactions, T. N. JONES and L. O. PALMER (*Agr. Engin., 13 (1932), No. 8, pp. 199, 200, figs. 4*).—Studies conducted jointly by the departments of agricultural engineering and plant physiology of the Mississippi Experiment Station to determine the factors involved in the curing of hay and their relationships are reported.

It was found that alfalfa double-windrowed 2 hours after cutting seems to give the most desirable cured hay. The reaction of stomata on cutting hay indicates a physiological periodicity in the plant apparently not entirely due to external influences. The stomata open and close periodically. The data indicate that hay should be left overnight in a position with the smallest amount of surface exposed. Crushing hay reduces the time required for curing.

A simple system for testing ground feeds, E. A. SILVER (*Agr. Engin., 13 (1932), No. 7, pp. 183, 184, fig. 1*).—The ratio system for determining the fineness of ground feeds and to provide a guide for feed grinding is described as developed at the Ohio Experiment Station.

The size of the sample selected for test is 10 oz. for grains and 5 oz. for roughage. Two screens are used, with a container beneath to catch the fine material which passes through the second screen. For grains the 14-mesh and the 48-mesh screens are used, while for roughage the 4- and 14-mesh screens give the best results. A set of ounce scales is required to weigh the material. The sample is placed in the top screen and shaken for approximately 2 minutes.

The amounts of material held on each screen and in the pan are then weighed separately. The fine screen allows the undesirably fine material to pass through. What passes through the 48-mesh screen is not desirable from the feeding or nutrition standpoint. Therefore, for a high quality of ground feed, the last figure in the ratio should be as close to zero as possible. Probably never will any feeds be required to be ground any finer than 0 : 10 : 0 fineness.

The system indicates to some degree the relative size of particles in the ground feed, particularly the finely pulverized material which is so undesirable.

Data are presented on fineness tests of shelled corn, wheat, and oats, and on the effect of moisture content on the results from the ratio and moduli systems. Samples containing 12 to 13 per cent moisture were tested, then dried to constant weight, and again tested. Practically no difference in the fineness results is shown for the ratio system, but a slight variation appears with the moduli system.

The ratio of fineness in terms of grade numbers is expressed by a chart, the use of which is explained.

Poultry housing, T. B. Charles and A. E. Tepper (*N. H. Univ. [Agr.] Ext. Circ. 138 (1932), pp. 19, figs. 13*).—Practical information is given on the planning and construction of poultry houses to meet the conditions and requirements of New Hampshire. Working drawings of suggested structures are given, together with bills of materials.

O. S. C. 400-hen laying house, A. G. Lunn and W. J. Gilmore (*Oreg. Agr. Col. Ext. Bul. 447 (1932), folder, figs. 3*).—Complete working drawings for this structure are given, together with practical information on its construction and a bill of materials.

The poultry house floor, R. H. Waite (*Maryland Sta. Bul. 334 (1932)*, pp. *63–78, figs. 11*).—In part 1 of this bulletin experiments are reported in which common straw was found to be a satisfactory material for insulating a cement poultry house floor against rise of capillary moisture. A moisture test was made in which 25 gal. of water was poured daily through a small hole in the straw-insulated floor for 16 consecutive days in weather of late winter. There were no signs of dampness on the surface of the floor at any time. At the end of approximately three years it was found that the straw had rotted out leaving a dead air space underneath the cement. A straw-insulated floor was found to dry very quickly, which is of special advantage in late fall construction. Directions for construction and amount of material required are given.

In part 2 experiments are described which showed that a poultry house floor built of cement is warmer in cold weather and cooler in warm weather than a wood floor, due to the equalizing effect of the soil underneath. A wood floor maintains approximately the same temperature as the outside air. A cement floor is much more comfortable to the birds in extreme heat waves and is likely to have a favorable effect on mortality due to heat. The possibilities of bettering temperature conditions in a poultry house by building it partly under ground, where conditions are favorable for this construction, are pointed out.

Home storage of fruits and vegetables, F. H. Beach and E. B. Tussing (*Ohio Agr. Col. Ext. Bul. 123 (1931), pp. 11, figs. 8*).—Practical information is given on the requirements and equipment for the home storage of vegetables, apples, and pears, particular attention being given to the maintenance of proper conditions of temperature and humidity through ventilation and insulation. Cellar, pit barrel, and box storage are described and the last two illustrated.

Steam usage in Vermont cooperative creameries, O. M. Camburn (*Vermont Sta. Bul. 339 (1932), pp. 8*).—The results of a special steam study at seven

cooperative creameries are reported as conducted to determine the evaporating efficiency of the several boilers and the amounts of steam used.

The coal cost of evaporating 1,000 lbs. of water ranged from 45 to 87 cts., the cost of coal accounting for half of the total cost of steam generation. Coal wastage through steam leaks ranged from 177 to 522 lbs., averaging $2.43 daily. The straightaway can washers used more steam than did the rotary type. The coal usage for condensing operations averaged 54 lbs. of coal per hundredweight of plain condensed and 57 lbs. per hundredweight of sweetened condensed skim milk. Total steam consumption used for manufacturing casein averaged 14 lbs. per hundredweight of skim milk, an average coal usage of 76 lbs. per hundredweight of dried casein.

A steam turbine cream separator used nearly 8 lbs. of coal per 1,000 lbs. of milk separated. The steam usage at two creameries using steam engines averaged 414 lbs. per 1,000 lbs. of milk received. The exhaust steam could have been utilized in water heaters to conserve the heat units. The small reciprocal steam pumps used to pump milk cost two-thirds of a cent per 1,000 lbs. of milk pumped. The steam usage in preheating milk for separation cost 3 cts. per 1,000 lbs. of milk heated. Steam usage per hundredweight of cream pasteurized ranged from 4.5 to 10.5 lbs., being lowest when the temperature rise was smallest. The most efficient work was done when vats were nearly full.

Farm fencing, J. B. Wilson and A. Carnes (*Ala. Polytech. Inst. Ext. Circ. 136 (1932), pp. 18, figs. 18*).—This circular presents practical specifications for fencing and fence construction for the various inclosures needed on Alabama farms. It deals with both wood and wire construction and gives information on the preservative treatment of fence posts.

AGRICULTURAL ECONOMICS AND RURAL SOCIOLOGY

List of State official serial publications containing material on agricultural economics, compiled by E. M. Colvin (*U. S. Dept. Agr., Bur. Agr. Econ., Agr. Econ. Bibliog. 38 (1932), pp. I+222*).—This is an annotated list of references to economic material relating to agriculture contained in the State official serial publications received currently by the Library of the Department. The publication includes market, crop, and tobacco sales reports, reports of State departments of agriculture and tax commissions, bulletins devoted entirely to advertising the products of the State, and general periodicals dealing with the agriculture of a State.

Research in progress in the Bureau of Agricultural Economics, July 1, 1932 (*U. S. Dept. Agr., Bur. Agr. Econ., 1932, pp. [4]+102*).—This is a mimeographed list of the 304 research projects in progress on July 1, 1932. The title, objective, personnel, date begun, probable date of completion, and the cooperation with other bureaus of the Department, other departments, State agricultural experiment stations, or other institutions, organizations, etc., are shown for each project.

[Investigations in agricultural economics at the Kentucky Station, 1931] (*Kentucky Sta. Rpt. 1931, pt. 1, pp. 9–19*).—Results of investigations not previously noted are reported on agricultural credit and finance on 600 farms in four sections of the State; organization studies of 47 typical Bourbon County farms, the comparative investment and earnings for the years 1926–1930 of farms studied in Taylor, Green, and Adair Counties; a land utilization study in Laurel County; a study in Knott County, using data obtained from 228 farm families for 1929 of the average size of farms, acreage cropped, investment, receipts, expenses, and value of food, fuel, and other items of family living furnished by the farm, and of the possibilities of the practice of forestry as illus-

trated by a 5-acre tract of young yellow poplar timber on one farm; rural community organizations in three counties; the use of the motor truck in transporting livestock from Kentucky counties to the Cincinnati and Louisville markets in 1930 and to the Evansville market from January 1 to November 11, 1931; the cost of farm implements, using data obtained from 35 Bourbon County farms as to the average investment in machinery, the average annual depreciation in value and annual repair costs, and the annual cost per crop acre; and a study in marketing tobacco.

An economic study of agriculture in northern Livingston County, New York, S. W. WARREN (*New York Cornell Sta. Bul. 539 (1932), pp. 244, figs. 18*).—The results of this study were presented to the faculty of the Graduate School of Cornell University in July, 1931, as a thesis in partial fulfillment of the requirements for the degree of doctor of philosophy.

The author views every farm as an experiment station and the experiences and experiments of farmers, when collected and related, as valuable agricultural knowledge. The history of the use of the survey method of farm management research in New York is briefly outlined. The survey is compared with the cost accounting method. The latter is deemed more expensive, more detailed, and the sample is better than the average. The survey, being less expensive, makes it possible to obtain more limited information on a greater number of farms.

Data obtained from three surveys, 1908, 1918, and 1928, are compared. Five hundred and seventy-eight out of 671 records taken in 1908, 697 out of 724 in 1918, and 514 out of 597 taken in 1928 were used in the analysis. The average size of farms was 148 acres in 1908, 148 acres in 1918, and 166 in 1928. The increased acreage per farm was almost entirely in pasture The average labor income was $589 in 1908, $203 in 1918, and $386 in 1928. Between 1908 and 1928 there was a decrease in the acreage of corn for grain, an increase in the acreage of corn for silage, an increase in the acreage of sweet corn and peas, and a striking increase in the acreage of alfalfa, accompanied by a decrease in the acreage of other hay. In this time, the number of dairy cows per farm increased from 9.6 to 12, the number of sheep per farm decreased 34 per cent. the number of hogs and pigs decreased 67 per cent, and owing to the introduction of trucks, tractors, and automobiles the number of work horses and mules decreased.

Farmers with the largest herds were more successful than those with the smallest herds. In 1908, most of the cows were Shorthorn, or Shorthorn grades, while on April 1, 1929, 99 per cent of the cows for which the breed was obtained were in herds which were predominantly of a dairy breed. In 1908 the amount of milk produced per cow, exclusive of that fed to calves or wasted, was 4,223 lbs., in 1918 it was 4,423 lbs., and in 1928 it was 5,658 lbs.

During the period stated, the general level of the education of the farmer operators increased. Farmers in the higher education groups were, on the average, more successful than those in the lower education groups. The handicap which the untrained man must overcome is constantly increasing.

The amount of milk used in the household increased from 146 qt. per individual in 1909 to 254 qt. per individual in 1928. The total value of all farm products used in the household was $290 in 1909, $448 in 1918, and $343 in 1928. The average value of the operators' houses was $2,308 in 1919 and 2,760 in 1929. Of the farmers' relatives who were engaged in nonagricultural occupations, about twice as many were in professional work as would be expected of a similar number of urban people.

Other data are also summarized and discussed.

Forestry in the economic life of Knott County, Kentucky, R. B. CRAIG (*Kentucky Sta. Bul. 326 (1932), pp. 39, figs. 7*).—This bulletin reports part of the results of a land economic survey of Knott County made in the summer

of 1930 in cooperation with the Bureau of Agricultural Economics, Forest Service, and Bureau of Home Economics, U. S. D. A. Tables are included and discussed showing for the county the land utilization; composition of the forest; distribution of timber, by types and merchantability classes; the present stand of timber; and the average stand and annual growth, by types and classes of timber. The forest history of the county, the production of lumber and other forest products, milling and marketing, the present ownership of land, the forest income of farmers, and the place of forestry in the economic future of the county are discussed. The steps necessary in developing the forests of the county are outlined.

An economic study of the pecan industry, S. A. JONES, V. C. CHILDS, R. S. WASHBURN, B. H. THIBODEAUX, J. W. PARK, and H. E. RUTLAND (*U. S. Dept. Agr., Tech. Bul. 324 (1932), pp. 91, figs. 4*).—This study was made in cooperation with the Alabama State Department of Agriculture and the Florida, Georgia, Louisiana, and Mississippi Agricultural Colleges for the purpose of supplying basic economic information to assist in the sound development of the pecan industry. The location of pecan-producing districts, the number, age, and varieties of trees, size of holdings, and the production and future trends in production are described and discussed. Analysis is made of the cost of production, and tables are included showing for each of the pecan-producing districts the costs per acre, by years, of developing a pecan orchard and the annual labor and power costs per acre of operating orchards up to harvest time. Shipping-point practices, the disposition made by growers of the 1928 crop, shipping-point prices received for different classes of nuts, 1925–1930, and by growers in different States, 1925–1931, and the distribution of the 1928 crop are discussed. The returns from questionnaires dealing with marketing sent to wholesalers, retailers, and consumers are analyzed. The pecan-marketing conditions in New York City, Cincinnati, Chicago, and St. Louis, the shelling industry, and the competition between pecans and other nuts are discussed.

Organization of the range cattle business in eastern Montana, R. S. FLETCHER (*Montana Sta. Bul. 265 (1932), pp. 63, figs. 3*).—Some of the common activities of cattlemen from about 1880 to approximately 1908 are described, and a brief history is given of the organization and activities of the Shonkin and Northern Montana Roundup Associations and the Montana Stock Growers Association.

Hog prices and the hog enterprise on Idaho farms, T. L. GASTON (*Idaho Sta. Bul. 191 (1932), pp. 20, figs. 11*).—The purpose of this bulletin is to present information on normal changes in hog prices, periodic movements in the wheat-hog ratio, the spread between hog prices at western markets and at middle western markets, and the relationship between the size of this differential and the number of hogs on western farms. Charts are included showing cycles, 1910–1931, of hog prices on the Portland, Oreg., and Chicago markets and the average seasonal changes in Idaho farm and Portland prices of hogs in years when the price trend was upward and in years when the price trend was downward; the monthly wheat-hog ratio based on Idaho farm prices, 1910–1931; the monthly differential between Portland and Chicago hog prices, 1910–1931; and the relation of the differential between Portland and Chicago prices of hogs and the number of hogs on farms on January 1 in the 11 Western States.

The period 1910–1931 contained two major and three minor cycles in hog prices on both the Portland and Chicago markets, the last period of peak prices coming in the fall of 1930. The normal seasonal variations in hog prices on the Portland market and on Idaho farms was found to differ during periods of falling and periods of rising prices. When the price movement was down-

ward, the peak in prices both at Portland and on Idaho farms came in August, with a secondary peak in April. In years when the price trend was upward, there was but one peak, that in Idaho being in September and that at Portland in August.

The normal or average wheat-hog ratio for the period 1910–1931 was 8.9, but since the spring of 1930 the price of wheat has declined so that in August, 1931, the ratio was 21.3. The wheat-hog ratio was found to be normally favorable to hog production from July to November. During the periods 1910–1915 and 1919–1930 hog prices in Portland were above Chicago prices, due to the Western States being a "deficit area" for hogs. In the latter half of 1931 Chicago prices were the higher, due to the Western States having increased production. Analysis of available data indicates that with an increase of more than 12 per cent in hog production in the Western States above the 1910–1931 trend, these States will no longer constitute a deficit area and the premium in prices will be reduced or eliminated.

An economic study of the hog enterprise, J. A. Hopkins, jr. (*Iowa Sta. Bul. 294 (1932), pp. 153–188, figs. 7*).—This bulletin is based chiefly on detailed records obtained in studies, made in cooperation with the Bureau of Agricultural Economics, U. S. D. A., of the hog enterprise in Humboldt, Iowa, and Webster Counties, and supplementary material from farm business records kept under the supervision of the Iowa Extension Service. The 159 records in Humboldt County covered the years 1922–1924 (E. S. R., 60, p. 484), the 62 records for Iowa County the years 1925–1927, and the 113 records for Webster County the years 1928–1930. The extension service records were taken on 572 farms in 1929. Analysis is made of the costs and returns on the hog enterprise and the influences of size of the enterprise, costs of the breeding herd, economy in the use of feeds, use of mineral mixtures, and rates of gain on costs and profits. Economy in the maintenance of the breeding herd and in fattening pigs, one-litter v. two-litter organizations, the income from and the size of the hog enterprise, and the consumption of crops and utilization of labor by hogs are discussed.

The average amounts of feed required per 100 lbs. of gain were from 434 to 457 lbs. of corn, from 38 to 56 lbs. of oats, 5 to 12 lbs. of tankage, and 4 to 9 gal. of skim milk, besides small amounts of other concentrates. The Humboldt County study showed that (1) a decline of 10 cts. per bushel in the price of corn, 5 cts. per bushel in the price of oats, and 5 cts. per hour in the cost of labor reduced the cost of hogs approximately $1 per 100 lbs.; (2) the costs of the breeding herd, including the feed eaten by the pigs during the suckling period, amounted to about one-third of the total cost of production; (3) about 25 bu. of corn, 7 bu. of oats, 147 lbs. of tankage, and 31 gal. of skim milk were fed per year per animal in the breed ng herd; and (4) about 7.5 bu. of corn, 1 bu. of oats, 4 to 5 lbs. of tankage, and 8 gal. of skim milk were fed per 100 lbs. of gain after weaning.

The Iowa County study showed that while there was a difference in organization between one- and two-litter farms, there was no tendency for either group to earn a higher net farm income.

On individual farms the size of the hog enterprise varied rather closely with the acreage of corn raised and the labor available for handling the hogs, especially at farrowing time, and to a certain degree with the number of steers fed.

Costs and returns in producing milk, raising heifers, and keeping herd bulls in Maine, G. F. Dow (*Maine Sta. Bul. 361 (1932), pp. 175, figs. 17*).—Records for the year ended March 31, 1928, were obtained from 178 dairymen, of whom 93 sold whole milk, 75 sold cream, and 10 sold both milk and cream. The dairy industry of the State and the herds studied are described.

An average of 10.9 cows were kept per herd, and 1 yearling heifer was raised for every 2.8 cows. The average milk production per cow was 4,994 lbs. containing 213 lbs. of butterfat. The major requirements per cow were 1,778 lbs. of concentrates, 5,908 lbs. of dry forage, 4,074 lbs. of succulent feed, 153 days of pasture, and 168 hours of labor for doing chores. Of the total cost per cow, feed represented approximately 52 per cent and chore labor 31 per cent. For heifers, the percentages were 65 and 18 per cent, respectively.

An average of about 1 lb. of grain was fed for each 3 lbs. of 4 per cent milk produced. Herds receiving grain containing from 21 to 22.9 per cent of crude protein had the highest labor return per cow. Silage was fed to 60 per cent of the herds. The cows given silage were fed 8.65 per cent more roughage, expressed as hay equivalent, and produced 7.3 per cent more milk than those fed no silage. The cost of dry forage and succulent feed was 21.84 per cent higher and the labor return $7.65 less per cow for the herds fed silage.

Labor required per cow for each kind of chore work, except milking, was about 50 per cent less in the larger herds than in the smaller herds. For milking, it was about one-third less. Cows with high milk production required no more labor than did low producing cows. The reduction in the value of labor required where milking machines were used more than offset the additional cost for the use of equipment, including milking machines. The value of milk produced represented approximately 84 per cent of the total returns from cows. The average labor return per cow for herds producing less than 4,000 lbs. of milk per cow per year was $12.06, as compared with $65.96 in herds averaging 6,000 lbs. or more.

Herds with a relatively uniform seasonal sale of milk and cream received a slightly larger labor return per cow than did herds with a high production during June. Net appreciation represented nearly 80 per cent of the total returns for heifers. The labor return averaged $40.98 per cow, or 26 cts. per hour, for the herds where milk was sold, and $40.33 per cow, or 23 cts. per hour, for herds where cream was sold.

The combined value of 34.24 lbs. of grain, 105.72 lbs. of hay, 70.24 lbs. of silage, and 3.24 hours of man labor was found to equal 88.09 per cent of the total net cost of producing 100 lbs. of 4 per cent milk. An increase in the size of herds, in pounds of milk produced per cow, and in the proportion of purebred cows in the herd reduced the net cost of producing milk. The 15 most profitable herds had a labor return of $94.98 per cow, as compared with a loss of $11.89 for the 15 least profitable herds. The average labor return per heifer was $2.13, or 9 cts. per hour, on milk farms and $4.91 per heifer, or 19 cts. per hour, on cream farms. The 15 herds with highest returns per heifer had a labor return of $25.13 per heifer, as compared with a loss of $17.54 per heifer in the 15 least profitable herds.

Organization, feeding methods, and other practices affecting returns on irrigated dairy farms in western Montana, S. E. Johnson, J. O. Tretsven, M. Ezekiel, and O. V. Wells (*Montana Sta. Bul. 264 (1932), pp. 73, figs. 19*).—This study was made in cooperation with the Bureau of Agricultural Economics, U. S. D. A., the field work being completed in 1928. The advantages and disadvantages of dairying in the area studied are compared with those in other areas and with possible alternative types of farming in the areas studied. The organization of different size dairy farms in the area, the use of milking machines, and herd housing are discussed. Using cow-testing association records covering 52 herds of 611 cows, statistical analysis is made of the influence on production per cow of total amount of feed, amount of concentrates fed, date of freshening, and characteristics of the individual cows—weight, age, and breed. A table is included showing the expected production per cow

and the return above feed costs with hay and grain at different prices and butterfat prices of 30 and 40 cts. per pound, when the amount of feed fed and the proportion of concentrates are varied for cows of average capacity. The trend in seasonal production and the present seasonal variations in production and in prices in the area studied are compared with those for a creamery in southeastern Minnesota. The possibilities of shifting a larger proportion of the total milk production of the farms of the area to the winter months by fall freshening, better winter care, and having the cows in good condition at the beginning of the winter are discussed.

The statistical methods used in the analysis of feeding practices and production from the cow-testing association records are described.

An economic study of 249 dairy farms in Florida, B. McKinley (*Florida Sta. Bul. 246 (1932), pp. 119, fig. 1*).—Analysis is made of detailed records for the year ended December 1, 1927, kept on 249 farms in 6 of the leading commercial dairy districts of Florida, the number in each of the several districts varying from 24 to 64. The first part of the bulletin (pp. 6–58) deals with the farm business of the farms as a whole, and the tables and explanatory text cover the history, education, age, and tenure of operators; utilization of land; crop yields; use of fertilizer; costs of operating trucks, automobiles, and tractors; the number of animal units; amount and distribution of real estate capital; receipts from different sources; expenses of different kinds, costs of concentrates, roughage, and pasture; amount and cost or value of paid and unpaid labor, value of operator's labor and management, and variations in labor income; and the value of items furnished by the farm. The second part of the bulletin deals with the dairy enterprise, and the tables and text set forth data as to breeds, number of calves, and cost of raising and value of heifers; age, sales, deaths, and replacement of cows; appreciation and depreciation of cattle; man labor on cows; cost of producing milk on the average and on the most profitable farms, cost of hauling and retailing milk, and costs for buildings, dairy equipment, and bull service; the returns, by months, for milk; quantities of feed and hours of labor used per 100 lbs. of milk; and the variations in cost of producing milk.

Some of the findings of the study were that it is probably cheaper to buy heifers at freshening time than to raise them, but that there is uncertainty as to their producing ability. As a rule labor income increased with increased production per cow. In the groups producing 4,000 lbs. of milk and less per cow, retailers and wholesalers lost about equally, but the relative advantage of retailers increased rapidly in the higher production groups. In four of the areas higher average labor incomes were made on the farms selling milk at retail, the exception in the two other areas being due chiefly to lower milk production per cow. The fewer the hours of labor per 100 lbs. of milk produced, the lower was the cost and the higher the labor income. The larger the herd in each production group, the more efficient was the labor and the higher the labor income.

An appendix discusses and illustrates how the data obtained in the study may be used for determining costs, returns, etc., with current prices of feeds, labor, and milk.

Factors affecting the cost of dairying in western Nevada, C. Venstrom and F. B. Headley (*Nevada Sta. Bul. 128 (1932), pp. 28, figs. 10*).—This is the second of a series of studies of farm enterprises in western Nevada (E. S. R., 62, p. 575). It is based chiefly on records kept by cooperating farmers and information obtained by the route statistician, who visited the farms frequently. Of the 80 records covering 42 herds and 1,892 cow years, 41 were for

the Newlands project for the years 1926–1930, 21 for the Carson Valley for the years 1928–1930, 8 for the Walker River area for 1929–1930, and 10 for the Truckee Meadows for the years 1926–1928. The importance of dairying in western Nevada, market conditions, the effects of a heavy alfalfa ration on production, death loss, and breeding ability of dairy cows, the cost of raising dairy heifers, and the farm adjustments possible to meet low prices are discussed. Tables and charts are presented and discussed showing the size of the farm business and the sources of cash income in the four sections, the feeding practices, feed costs, total cost per cow, hay prices and costs, labor returns, chore labor requirements, milking machine costs, building costs and investment, death loss, and the calf crop. Data for use in preparing a dairy enterprise budget are given.

The annual average consumption of hay per cow was nearly 6 tons supplemented by 39 days of pasture on the Newlands project, and from 3.6 to 4.2 tons supplemented by from 116 to 171 days of pasture in the other areas. The total costs less labor, total credits, labor return, and number of hours of labor per cow in the different areas were $101.61, $131.57, $29.96, and 131 hours, respectively, on the Newlands project; $100.81, $134.48, $33.67, and 138 hours in the Carson Valley; $81.02, $108.26, $27.24, and 87 hours in the Walker Valley area; and $134.83, $174.68, $39.85, and 166 hours in the Truckee Meadows area. The average chore time per year per cow decreased from 148 hours for the 10-cow herds to 100 hours for the 40-cow herds. Milking machines saved 21 hours of labor per cow per year, but increased other costs $4.78, the yearly cost per machine being $146.01. Building costs were generally higher with higher production, but there was no evidence that appreciably higher production resulted from better buildings as measured by higher building costs. Death loss of dairy cows was about 5 per cent, being about double the percentage of that in regions where less hay and more grain are fed. The calf crop averaged from 89 to 95 per cent of the average number of cows in each area. The labor return per cow per year, 1926–1931, varied from —$6.04 to $59.74, averaging $41.50, for the 10 high-producing herds, and from —$24.88 to $13.96, averaging $3.15, for the 10 low-producing herds.

The Missouri farm real estate situation for 1930–1931, C. H. Hammar and R. P. Callaway (*Missouri Sta. Research Bul. 172 (1932), pp. 59, figs. 11.*)—This is a continuation of the study previously noted (E. S. R., 66, p. 679).

Farm incomes, population and farm production, increased efficiency of agricultural production, trends in farm acreages and number of farms and farmers, and foreign demand for agricultural products are discussed in relation to their effects on the general structure of farm real estate values in the United States. The effect of farm real estate taxes in Missouri on land values; the movements of farm values in Missouri as compared with other States of the West North Central division of the United States and of the United States as a whole; the number of transfers of farm real estate by warranty deeds and trustee and sheriff deeds in 13 Missouri counties in the first six months of 1929, 1930, and 1931; Missouri land values as shown by census and sales data; and gross rents in Missouri are discussed. Tables are given and discussed showing, by years 1927–1931, the number of sales, acreage transferred, consideration, value per acre, and index of values (1927=100) in the several type-of-farming areas in Missouri.

The index of farm real estate values in Missouri (1927=100) dropped from 83 for the first six months of 1930 to 72.5 for the corresponding period in 1931.

The following table shows the changes in the indexes from 1930 to 1931 for the several counties in the type-of-farming areas:

Changes in indexes of values of farm real estate, 1930 to 1931, in Missouri type-of-farming areas

Type-of-farming area and county	Year	
	1930	1931
	Per cent	*Per cent*
Northern meat production:		
Atchison County	91.6	69.9
Harrison County	67.2	69.6
Sullivan County	78.8	60.4
Ralls and Callaway Counties	56.5	57.6
Johnson County	76.4	90.6
Ozark border (Franklin County)	103.2	95.0
Ozark meat production:		
Miller County	102.4	78.0
Reynolds County	71.7	74.4
Western corn and small grain (Barton County)	77.7	81.0
Ozark Plateau dairy (Polk County)	74.3	77.4
Southwest fruit and dairy (Newton County)	74.3	62.9
Southeast lowlands (Pemiscot County)	89.4	66.7
State (13 counties)	67.9	63.4
State (weighted average)	79.9	71.8

Farm tenancy in Delaware, R. O. Bausman (*Delaware Sta. Bul. 178 (1932), pp. 123, figs. 59*).—A dissertation based upon the 1928 data of this study was presented to the faculty of the Graduate School of Cornell University, February, 1931, as a thesis in partial fulfillment of the requirements for the degree of doctor of philosophy. The bulletin is divided into two parts. Part 1 treats of the historic and economic background of farm tenancy, influence of the rental contract on the type of farming and farm organization, and conflicting interests between landlord and tenant. Part 2 treats of the personal history of owner-operator, landlord, and tenant; factors influencing the period of tenure of the tenant; attitude of the landlord and tenant toward the farm rental system; history of the farms; and financial status of owner-operator, landlord, and tenant. A suggested form of farm lease is included.

In the usual type of rental contract in the areas studied, the landlord provides the real estate, repairs on permanent improvements, insurance and taxes on his own property, and bears one-half the expense of fertilizer and seeds. The tenant furnishes the operating equipment, including work stock, machinery, and all dairy cattle, and bears one-half of the expense of fertilizer and seeds. The tenant gets all dairy and poultry products and shares the crops produced half-and-half with the landlord.

Inheritance and sentiment, which have been the two most important factors influencing land ownership in Delaware, are declining in importance. The number of tenant-operated farms in the areas studied ranged from 50 to 85 per cent. The number, however, in the State as a whole has decreased about one-third during the past three decades. It is thought that during the next few decades, the number of tenant-operated farms will continue to decrease, though possibly more slowly, until the percentage becomes normal. Due to opportunities for Delaware tenants to secure alternative employment, good tenants are becoming scarce.

It is pointed out that, though many weaknesses are found in the present rental contract, it is probably the most workable contract under existing Delaware conditions.

The farm mortgage situation in Putnam, Union, and Greene Counties, Ohio, V. R. Wertz (*Ohio Sta. Bul. 509 (1932), pp. 32, figs. 2*).—This study deals primarily with farm real estate mortgages, but some consideration is also given to chattel mortgages. The data were obtained from the records of

the county recorders of the three counties. Tables are included and discussed showing for the years 1910, 1920, 1925, 1930, and 1931 data regarding the total value of farms and total mortgage indebtedness (no 1931 data), number and amount of mortgages, and acreage and value of land covered by mortgages recorded, ratio per acre value of land and buildings to indebtedness recorded, and indexes of farm product prices, land value per acre, and farm mortgage indebtedness recorded. Other tables give for 1910, 1920, 1925, 1930, and in some cases 1931 data as to the sources of funds, number and amount of loans, average loan per acre, average period of loan, and average interest charge of different loan agencies. The number of foreclosures, acreage covered, the amount of judgment, and the amount for which properties sold, by years 1910–1931, and the number of farms and acreage in voluntary assignments to financial institutions, by years 1925–1931, are shown. Other tables also show the number of chattel mortgages and the amount of money so borrowed, by years 1910–1931; the sources of such funds in 1930; and the number of chattel mortgages and amount thereof filed on farm and on city property in 1930.

The ratio of farm mortgage debt to the value of farm land and buildings in the three counties increased from 6.8 per cent in 1910 to 17.7 per cent in 1930. The ratio to the value of land and buildings of the farms on which the mortgages were recorded increased from 35.9 to 44.4 per cent in 1925 and was 40 per cent in 1931. The average size of recorded farm mortgage was $2,683 in 1910, $6,091 in 1920, and $2,714 in 1931. The average period of loan during 1910 was 4 years, during 1920 4.8 years, and during 1930 4.9 years. Interest rates ranged from 5 to 8 per cent, the most common rate averaging about 6 per cent. The number of farms foreclosed on was 8 in 1910 and 80 in 1931. In 1910 the properties sold for $5,129 more and in 1931 for $179,362 less than the judgments. The number of chattel mortgages increased from 1,571 in 1910 to 9,547 in 1929 and stood at 8,341 in 1931. Approximately 50 per cent of the chattel mortgage loans in 1930 was to farmers. The interest rates ranged from 5 per cent per year to 3 per cent per month.

Indebtedness on 48 Potter County farms, 1930, C. M. Hampson and P. Christophersen (*South Dakota Sta. Circ. 2 (1932), pp. 15*).—This circular presents part of the findings of a study of farm operations and farm management made on the 48 farms during 1930. Of the farms, 21 had mortgages on livestock and 42 had miscellaneous notes and accounts outstanding, and 35 of the 39 owner-operated farms had real estate mortgages. Tables are included and discussed showing the average indebtedness, January 1 and December 31, 1930, by kinds of debt, the sources of borrowed funds, and the number and amount of miscellaneous debts of different kinds; the average investment, indebtedness, and fixed charges on indebtedness of 10 farms with high and 10 farms with low indebtedness; and the way in which debt obligations were met during 1930 on the 48 farms. The terms of the loans, the annual burden of indebtedness, average cash expenditures and receipts on the 48 farms, and some possibilities of reducing expenses are also discussed.

Farm real estate mortgage loans in Hyde County, South Dakota, 1910–1930, G. Lundy (*South Dakota Sta. Circ. 4 (1932), pp. 57, figs. 16*).—The purpose of this study was to procure information regarding present and past conditions of the farm land indebtedness situation in the area of the State of which Hyde County is representative. It is based on information regarding the townships of Loomis, Valley, and Spring Lake procured from the records of the register of deeds of the county.

Data covering all transfers of title since 1905 and all mortgage loans in force against the lands from 1910 to 1930, inclusive, are included. Most of

the tabulations are made for the years 1910, 1915, 1920, 1925, and 1930. Some, however, are for 5- or 10-year periods and a few for shorter periods. The tables and charts included and discussed show the total indebtedness and the amount in loans of different ranks, the area mortgaged and debt per acre, amount and percentage of loans delinquent, sources and costs of funds for loans of different ranks, terms and rates on and amounts of loans per acre by different agencies, and land values and ratio of debt to value. The relation of land purchases and indebtedness and other phases of the indebtedness situation are discussed.

Mortgage loans on farm real estate in Haakon County, South Dakota, 1910–1930, G. Lundy (*South Dakota Sta. Circ. 5 (1932), pp. 57, figs. 16*).—This is a study similar to that noted above. It is based on data from Elbon, Topbar, and Milesville Townships in Haakon County, selected as typical of the west-central part of the State.

Agricultural credit corporations affiliated with cotton cooperative marketing associations, W. H. Rowe (*U. S. Dept. Agr., Tech. Bul. 322 (1932), pp. 64, figs. 10*).—From 1924 to 1931, inclusive, 17 agricultural credit corporations affiliated with cotton cooperative marketing associations began operation. The characteristics of organization, operating practices, and loan requirements of and the types of loans made by these corporations are described. Using data from 11 of the corporations organized prior to 1931 in some cases and from 4 or 5 of such corporations in most cases, analysis is made of the volume, size and carry-over of loans, the loan losses, rediscount relations with the Federal intermediate credit banks, costs of loans to borrowers, and the income, costs, and profits of the corporations. The special problems of such corporations (ownership of stock by borrowers, local loan groups, extent of affiliation with cooperative marketing associations, and the excessive hazards of the loans), the importance of agricultural credit corporations as a source of farm credit, and the desirability of state-wide operations and of affiliation with cooperative marketing associations are discussed. A form of contract for use between an agricultural credit corporation and members of local groups is included. The findings of the study are summarized in part as follows:

"As financial institutions purely, their record, with few exceptions, has been disappointing. They have financed in all but one case only a very small portion of the farmers in their area—almost a negligible portion—although the business which they have done in those communities where banks have failed was undoubtedly a real help. In 1930, the combined volume of business was the highest of any year, but that was largely due to the rapid expansion of one of the most successful corporations, its business representing more than 60 per cent of the total. Many of those corporations that contributed to the large total volume of business in 1926 were out of business or in liquidation by 1930. Half of the corporations that have been organized have failed or have voluntarily gone out of business, and in 1931 only a few of them were aggressively going forward. In passing judgment on them, however, it should be kept in mind that farm credit agencies of other kinds have failed in large numbers during the same years.

"In addition to making an unimpressive showing as financing institutions, the corporations usually have failed to give substantial aid to the marketing associations. Estimates of the number of bales of cotton financed by all corporations have at no time placed them in excess of one-fourth of the total deliveries, and in the case of some corporations the portion of deliveries obtained by financing the crop has been negligible. Moreover, the volume of financing does not appear to have borne a close relationship to the volume of cotton delivered.

Nevertheless, some of the corporations have cost the parent associations substantial sums in the way of expenses of operation, the sacrifice of income on investments in their capital stock, and losses in the value of that stock.

"The case for agricultural credit corporations rests to-day not upon the needs of the cotton cooperative marketing associations for a financial subsidiary but upon the needs of farmers for credit. Although a number of the corporations have failed and most of them have proved relatively ineffective as a means of building up the marketing associations, it can not be gainsaid that they have rendered a real service to the members who have obtained loans. It is to be regretted that the service has been limited to such a small proportion of the farmers who needed it and that the cost to the cooperative or the other stockholders has been so high."

Louisiana farm taxes—I, Cost of government, public revenue, and farm taxes, B. W. Allen and R. L. Thompson (*Louisiana Stas. Bul. 231, pt. 1 (1932), pp. 34, figs. 7*).—This bulletin, the first of a series of three, was prepared in cooperation with the Bureau of Agricultural Economics, U. S. D. A. Tables are included and discussed showing for 1913 and 1930 the cost of and tax receipts for Federal, State, and local government in the United States, the cost of the State government of Louisiana by major functions, and the State and local tax levies on property in Louisiana. Analysis of farm taxes per acre and their relative change from 1913 to 1931 is made, using the actual tax records of 470 farms distributed through 32 parishes of the State. Tables and charts show the taxes per acre and indexes, 1913–1931, by crop-reporting districts, and the distribution of farm taxes in 1931, and make comparison of farm real estate taxes in Louisiana and those in neighboring States and in the east and west North Central States.

The estimated farm taxes in Louisiana for 1931 was 60 cts. per acre, as compared with 22 cts. for 1913. The tax indexes increase from 92 to 360 per cent in the different crop-reporting districts, the average increase for the State being 176 per cent. Of each dollar of farm taxes in 1931, 28 cts. went for school purposes, 21 cts. for roads, 19 cts. for State tax, 13 cts. for parish general tax, 12 cts. for levee tax, and 7 cts. for drainage tax. On a functional basis, 38 cts. was for education, 21 cts. for roads, 12 cts. for levees, 7 cts. for drainage, and 22 cts. for all other purposes.

Incidence of public school taxation in Oregon with special reference to elementary and county school fund laws, W. H. Dreesen (*Oregon Sta. Bul. 306 (1932), pp. 110, figs. 34*).—This is a study of the operation of the county school fund and the elementary school fund laws of the State in the collection of revenue and the apportionment of it among the school districts. The evident intent of the two laws is the equalization of the school tax burden among the districts within a county. Under the county school fund law a levy must be made on all taxable property in the county adequate to produce not less than $10 per capita for each child residing in the county between the ages of 4 and 20 years. The fund collected is apportioned $100 to each district and subdistrict in the county and the balance to the districts in the county in proportion to the number of children resident therein between the ages of 4 and 20 years. The elementary school fund law places a uniform levy of 2 mills on the equalized value of all assessable property in the State. The fund is apportioned to the districts within the county in which it is raised on the basis of the number of teachers employed in the first eight grades, with the provision that the number of teachers employed shall not exceed one for every 30 pupils or fraction thereof enrolled in the grades.

During the decade 1920–1930 the taxes on general property for public school purposes in the State increased 40 per cent. For the year 1928–29 weighted public school levies in the different counties ranged from 8.51 to 25.63 mills on equalized rural values, and from 14.45 to 38.49 mills on urban equalized values. Total taxes for school purposes constituted from 27.74 to 63.92 per cent of all rural taxes, and from 14.43 to 48.05 per cent of all urban taxes in the different counties. Average equalized valuations per school-census child in 1929 varied from $2,287 to $11,290 in the different counties, and in many counties the interdistrict variations exceeded the intercounty variations. More than 85 per cent of the funds raised through the elementary school fund levy and more than 83 per cent of those raised under the county school fund levy went back into the school district in which raised, and only 15.21 per cent of both levies was paid to districts other than those in which collected.

Of the city school districts with assessed valuations of $1,000,000 or over, 24 contributed annually an aggregate of $152,715.79 in excess of the apportionments received, and 45 received an aggregate of $243,358.37 annually in excess of their contributions. The elementary school fund law supplemented the county school fund law in excess apportionments by an average of $302,289 annually and counteracted it by an average of $18,735.22 annually. Excess apportionments were made to 1,214 school districts, of which 725 had general school levies (including special district, union high school, and high school tuition fund levies) below the average for their respective counties, 376 had assessed valuations above the average per school-census child, 300 had both general levies below their county averages and assessed valuations per census child above the average, and 806 had either or both lower-than-average general levies and/or higher-than-average per census-child valuations.

The author in his conclusions states: "The public school revenue laws of Oregon have been amended and added to with apparently two ideas in view, one to constrain the people to provide adequate revenue for the support of public education and the other to assist the financially weak districts in the support of their schools. The first object sought to be attained, the raising of adequate revenue, could be accomplished as effectively under a simple law as under a multiplicity of intricate laws. The simple law would have the merit of being understood by the great majority of taxpayers. The second object sought to be accomplished, the equalization of the school tax burden, has been attained with but partial if not questionable success."

Who pays for the highways? B. H. Hibbard and C. F. Wehrwein (*Wisconsin Sta. Bul. 423 (1932), pp. 40, figs. 11*).—This bulletin is based on an analysis of the reports and records of the Wisconsin Tax and Highway Commissions and the secretary of state, and on a study covering 20 representative counties for the period 1926–1930. Tables and charts are included showing the expenditures by the State, by years 1925–1929, for highways and for education; the expenditures on open country roads, by years 1912–1929, by towns, counties, and the State; the mileage of roads with different types of surfacing, 1907–1912, and by years 1912–1930; and the mileage, 1931, of Federal, State, and county trunk roads and of town roads. Other tables and charts are given and discussed showing, by years 1926–1930, the expenditures of the State, counties, and towns for roads of different kinds and the sources of the funds expended by each. Analysis is also made of the contributions to different taxes by residents of cities and villages, by farmers, and by nonresidents of the State, and of the relative use made of the roads by city and village residents and by farmers.

The expenditures for country roads (roads outside the cities and incorporated villages) in the State increased about eightfold from 1912 to 1929,

reaching $50,195,969 in 1929. The expenditures for these roads in 1912 constituted 10.3 per cent of the total expenditures of the State in that year and 19.6 per cent in 1929. In 1912 the towns spent more on country roads than the State and counties combined. In 1929 both the State and counties spent more than the towns, and the counties more than the State and towns combined. Of the money spent on country roads in 1930, 45.3 per cent was obtained from the property tax, 21.6 per cent from motor vehicle licenses, 15.3 per cent from the gasoline tax, 7.3 per cent from Federal aid, 2 per cent from the income tax, and the balance from miscellaneous taxes, fees, etc. Residents of the cities and villages paid 67.1 per cent of the gasoline tax and 63.2 per cent of the motor vehicle licenses; farmers paid 28.7 and 36.8 per cent, respectively; and 4.2 per cent of the gasoline tax was paid by nonresidents of the State. Of the money spent for all roads, 47.7 per cent came from farmers, 40.6 per cent from residents of the cities and villages, 7.3 per cent from Federal aid, 0.6 per cent from nonresidents of the State, and 3.8 per cent could not be allocated. Farmers were responsible for only 42.7 per cent of the travel on the roads by residents of the State. The contributions represented a tax rate of 10.1 mills on the general property of farmers, as compared with 3.6 mills on the general property of urban residents. Farmers in 1929 paid 4.2 per cent of the normal income tax, as compared with 95.8 per cent for the urban group.

Efficiency of cream stations in cream collection, C. O. Youngstrom, D. R. Theophilus, F. W. Atkeson, and G. N. Tucker (*Idaho Sta. Bul. 193 (1932), pp. 35, figs. 14*).—This study is based chiefly on information obtained from 122 cream stations by personal visits during 1930. Tables and charts are included classifying the stations by distance from creameries, number per town, frequency of shipments of cream to creamery, weekly volume of butterfat received, number of patrons, and patrons' average weekly volume of butterfat. The system of paying station operators, commission rates paid, and the returns to station operators are discussed. Analysis is made of the cost of operating 37 stations in 1929, and the station shortage of butterfat, the butterfat test of cream delivered, and the frequency and size of deliveries by patrons are discussed.

Potato marketing in Pennsylvania, F. F. Lininger (*Pennsylvania Sta. Bul. 278 (1932), pp. 39, figs. 6*).—This study is based chiefly on records obtained from 450 potato growers regarding the marketing of the 1928 crop, data gathered during the winter of 1930 regarding the relation of potato quality factors to prices in the Pittsburgh wholesale and retail markets, and a study of the handling costs and returns on one large farm in 1930 on which "baker" potatoes were sorted out and sold in 15-lb. sacks. Analysis is made of the amounts of their crops sold by the 450 growers by different methods of sale, the gross and net prices received with each method, relation of certain quality factors to prices in the Pittsburgh market, and the costs and returns on the farm selling potatoes as bakers.

Of the annual car-lot receipts of potatoes in the 15 Pennsylvania markets from 1923 to 1930, inclusive, only 5 to 22 per cent came from Pennsylvania shipping points. During 1925–1930 an average of nearly 13,000 carloads per year were received from outside the State, and less than 600 carloads per year were shipped out of the State to the six markets receiving the bulk of such shipments. In an average crop year it is estimated that about 10 per cent of the Pennsylvania crop is shipped by rail and 90 per cent by truck, and of the trucked shipments half were sold at the farm.

The average gross price per bushel received for potatoes in 1928 by the growers studied was 66 cts. for potatoes hauled by truck and 48 cts. for those

shipped by rail. The average marketing costs incurred by farmers ranged from 2.4 cts. per bushel on sales to truckers to 20.6 cts. on sales made on the curb markets, averaging 8.5 cts. on truck sales. On railroad shipments the average cost was 4.1 cts., exclusive of freight. Net prices received by the growers were 57 cts. per bushel for potatoes trucked to market and 44 cts. for those shipped by rail. Sales to customers at the farm brought an average net price of 80 cts. per bushel.

For the potatoes from the one farm which sold bakers in 15-lb. sacks, the cost of marketing was 33 cts. per bushel as compared with 10 cts. for U. S. No. 1 potatoes in 120-lb. sacks, but the price received was 50 cts. per bushel higher.

For the 276 carloads of potatoes under observation on the Pittsburgh market, it was found that (1) those in 100-lb. sacks sold at a somewhat better price than those in 120-lb. sacks, but the quality in the smaller sacks was better; (2) bright potatoes brought 13 cts. per 100 lbs. more than fairly bright potatoes and 18 cts. more than potatoes of dull or mixed color; (3) prices decreased with an increase in the percentage of defects, cars with less than 5 per cent of defects selling at an average price of $1.99 per 100 lbs., those with from 6 to 15 per cent of defects selling at $1.93, those with 21 to 25 per cent at $1.90, those with 26 to 30 per cent at $1.84, and those with over 40 per cent of defects selling at $1.41; (4) prices were consistently lower with increasing percentages of bruises, being $1.98 with 2 per cent or less of bruises, $1.92 with 5 per cent of bruises, $1.82 with from 6 to 10 per cent, $1.65 with 11 to 20 per cent, and $1.23 with over 40 per cent of bruises; and (5) 3 per cent or less of potatoes under 1¾ in. in diameter caused no noticeable reduction in price, as was also the case with 15 per cent or less of potatoes over 3¾ in. in diameter. No serious price reduction was found with from 30 to 40 per cent of the potatoes ranging from 1¾ to 2¼ in. in diameter, but with over 40 per cent there was a noticeable reduction.

The study indicated that local markets offer the best opportunity for the highest returns, and that other markets within trucking distance afford good outlets at higher returns to the grower than large city markets.

Sales methods and policies of the Calavo Growers of California, E. A. Stokdyk (*California Sta. Bul. 539 (1932), pp. 52, figs. 8*).—The purposes of this study were to analyze past and present sales methods employed by the Calavo (California avocado) Growers of California and suggest what changes, if any, should be made. The history of the organization is briefly outlined. Its growth is indicated by the fact that during the first nine months of 1924, 147,915 lbs. of avocados were handled, whereas in 1930–31, 3,097,332 lbs. were handled. In 1924 the number of members at the end of the year was 104, compared with 1,606 at the end of 1930–31.

The principal motive of the organization was to increase the demand for avocados, particularly outside of California. Its activities are conducted primarily for the benefit to members. The factors considered in making asking prices are (1) the prices at which consumers have purchased specific quantities in the past, (2) the probable effect of the prices of competing products on consumers' demand for avocados, (3) the season of the year as it may affect demand, (4) the probable effect of the general business situation, (5) the quality of the product, and (6) the long-time trend in demand. Various forms of advertising methods are discussed. A marked relation was noted between advertising activities and sales. Costs of operation of the organization are presented in the appendix.

Production and marketing calendar of American fruits, with particular reference to export fruit, compiled by A. C. Edwards, jr., and H. P. Gould

(*U. S. Dept. Agr., Bur. Agr. Econ., Foreign Serv. Rpt. 55 (1932), pp. 65*).—Part 1 of this mimeographed report includes tables for different fruits showing the accepted names of varieties, the most common synonyms, and the characteristics of each variety as to color, size, shape, use, and quality. Part 2 includes tables, by States, showing for the important varieties of each fruit grown the average blossoming, picking, and consumption periods and the storage periods with common and cold storage.

Marketing American dried fruit in Europe, M. J. Newhouse (*U. S. Dept. Agr., Bur. Agr. Econ., Foreign Serv. Rpt. 52 (1930), pp. [1]+35*).—This mimeographed report is based on a study made in Europe in 1928–29. It discusses the importance of Europe in the American dried-fruit trade, factors affecting the demand for American dried fruit, sales practices and marketing developments, and the prune-packing industry in Europe.

World apple production and trade, A. C. Edwards and H. H. Conrad (*U. S. Dept. Agr., Bur. Agr. Econ., Foreign Serv. Rpt. 57 (1932), pp. 98*).—This mimeographed report brings together statistics and other information regarding the acreages in apples, number of bearing and nonbearing trees, production, consumption, exports and imports of apples, sources of imports, destination of exports, etc., in different counties.

The competitive position of the dairy industry in New Zealand, P. F. Brookens (*U. S. Dept. Agr., Bur. Agr. Econ., Foreign Serv. Rpt. 54 (1931), pp. [2]+52, fig. 1*).—This mimeographed report discusses the dairy industry of New Zealand under the following headings: Agricultural resources and alternative farm enterprises, agriculture in relation to industry, production and utilization of milk, consumption as affecting exportable surplus, improvement of resources and technic, herd testing and its far-reaching effect upon dairying, economy in the use of labor, utilization of by-products, marketing organization, and the New Zealand surplus as affecting the United States.

Agricultural price supporting measures in foreign countries, L. R. Edminster, L. J. Schaben, and M. Lynsky (*U. S. Dept. Agr., Bur. Agr. Econ., Foreign Serv. Rpt. 56 (1932), pp. [2]+294*).—This "is a descriptive summary of recent and present agricultural price-supporting measures in foreign countries. In general, the measures discussed are such as have involved more or less intervention on the part of governments. This, however, is a somewhat difficult line to draw; and occasionally there is reference to activities which are largely private, though usually having at least the tacit support of the government Occasionally also, as in the case of the Canadian wheat pools, recent developments have brought increasing intervention in connection with activities which were formerly nongovernmental." No attempt is made to appraise the effects of the various measures or to catalogue the measures taken for the control and allocation of foreign exchange by governments or their agencies.

Crops and Markets, [October, 1932] (*U. S. Dept. Agr., Crops and Markets, 9 (1932), No. 10, pp. 369–408, figs. 3*).—Included are tables, reports, charts, summaries, etc., of the usual types.

Rural contributions to urban leadership in Montana, E. H. Lott (*Montana Sta. Bul. 262 (1932), pp. 44*).—The purposes of this study, made in cooperation with the U. S. D. A. Bureau of Agricultural Economics, were to determine some of the characteristics of leaders in Montana, to compare the effects of rural and urban environment on leaders, and to study the phenomena of leadership in general. The study was made of 1,307 Montana leaders representing ten occupational groups varying in talent required.

The leaders came from outside Montana in greater proportion than the general population of the State. The farm class produced more than its quota

of leaders, but families in professional, business, and managerial occupations produced a higher percentage of leaders than their percentage of the population. The semiskilled and unskilled class produced less than its quota of leaders. Seventy-five per cent of the leaders were rural-born and 58 per cent were rural-reared. The farm-reared leaders attained high rank more frequently than the village- and city-reared. A positive correlation was found between ability and mobility.

In an expanded form, this publication was accepted by the University of Wisconsin in partial fulfillment of the requirements for the degree of master of arts in 1929.

Advantages and disadvantages of country life: Selected references, compiled by L. O. Bercaw (*U. S. Dept. Agr., Bur. Agr. Econ., Agr. Econ. Bibliog. 37 (1932), pp. 30*).—References are included to material published since 1920 comparing the advantages and disadvantages of city and country life.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Curriculum making in agricultural colleges, J. T. Wheeler (*Athens, Ga.: McGregor Co., 1932, pp. [7+167], figs. 35*).—The author approaches the problem of curriculum making through objective research methods. The purposes of his book are (1) to point out briefly the widespread interest in curriculum problems now being shown by all types of institutions of higher learning in this country, (2) to show historically the relation of the sciences to curriculum determination in the agricultural college, (3) to indicate from a historical retrospect the factor of "mental discipline" as an agricultural college curriculum determinant, and (4) to introduce objective research as a basis for agricultural college curriculum determination. The conclusion is reached that readjustment of curricula is a continuous process, that there can be no fixity if progress is to be made, and that research in this field should be a continuous and long-time undertaking.

The extension service in agriculture and home economics, 1933 (*Illinois Sta. Circ. 398 (1932), pp. 42, figs. 3*).—This circular describes in detail 41 projects of the Agricultural and Home Economics Extension Service of the University of Illinois which it is believed will prove of most interest during 1933. It is designed primarily for the use of program committees of the county farm and home bureaus and farm and home advisers in deciding upon the lines of extension activities. Other projects being carried on are listed, and suggestions are made for building a county extension program in agriculture and home economics.

FOODS—HUMAN NUTRITION

Contributions to the science of nutrition: A tribute to the life and work of Max Rubner, G. Lusk (*Science, 76 (1932), No. 1963, pp. 129–135*).—An address presented before the American Association for the Advancement of Science at Syracuse, N. Y., June 23, 1932.

Graham Lusk: A brief review of his work, J. R. Murlin (*Jour. Nutrition, 5 (1932), No. 5, pp. 527–538, pl. 1*).—This biographical sketch outlines the specific contributions of the late G. Lusk to the knowledge of nutrition through his own investigations and those of his students, particularly on the specific dynamic action of proteins and amino acids, metabolism in diabetes, and energy metabolism in health and disease.

Frozen fruits and their utilization in frozen dairy products, M. J. Mack and C. R. Fellers (*Massachusetts Sta. Bul. 287 (1932), pp. 28, figs. 2*).—This

detailed report of an investigation which has been noted previously from progress reports (E. S. R., 65, p. 394) is presented in two parts, dealing, respectively, with methods of packing, handling, freezing, and storage as affecting the quality of frozen pack fruits and with the use of fruits thus preserved in the manufacture of ice creams, sherbets, and ices.

Strawberries are dealt with in greatest detail, followed by raspberries, peaches, and other fruits. Certain varieties of strawberries and raspberries were found to be more satisfactory than others for frozen storage. Yellow flesh varieties of peaches were more attractive when frozen than white varieties. Although plums, red currants, nectarines, cranberries, blackberries, blueberries, black and purple raspberries, and rhubarb were successfully preserved by freezing, they were not entirely satisfactory for use in ice creams but were fairly satisfactory for ices. Information on the effect of variety and sugar ratios in frozen strawberries, raspberries, and peaches on the quality of ice cream and on the characteristics of frozen pack cherries and miscellaneous varieties of fruits is given in tabular form.

In the section on ice creams and ices, points to be considered in the making of satisfactory ice creams are considered separately for strawberries, raspberries, peaches, cherries, and pineapple. The proportions of fruits found most satisfactory were about 15 per cent for strawberries, cherries, and pineapple, from 10 to 12 per cent for raspberries, and 15 to 20 per cent for peaches. The freezing time required for the desired consistency and yield varied with the type of fruit. About the same time was required for peach as for plain vanilla ice cream but less time for the other fruits.

A general discussion is included on various points to be considered in making fruit ice creams and fruit ices. For the latter a basic formula is given, together with directions for determining the acidity of the mix by titration of a sample of N/10 sodium hydroxide and expressing the results in terms of lactic acid. An acidity of 0.7 per cent is recommended as most desirable.

Public health aspects of frozen foods, C. R. Fellers (*Amer. Jour. Pub. Health, 22 (1932), No. 6, pp. 601–611*).—This is a general discussion, with numerous references to the literature, of the following factors which have a possible bearing on the public health aspects of the frozen foods industry: Sanitation and working conditions at the freezing plants, freshness and soundness of the raw materials, effectiveness and dependability of the freezing processes, the effect of freezing on the quality, chemistry, and nutritive values of foods, and the number and character of the microorganisms in the frozen foods and in the same foods after defrosting and standing. Original data on the bacteriology of frozen foods are included. These show that the content of bacteria in frozen foods is low, but increases very rapidly after defrosting. For this reason it is emphasized that frozen foods should be marked perishable and treated as such. It is considered that until more is known about the subject, frozen products should be consumed while still frozen or within a very few hours after defrosting.

Foods and drugs, J. M. Bartlett (*Maine Sta. Off. Insp. 143 (1932), pp. 16*).—This is the annual tabulation of the results of the examination of food and drug samples collected by the division of inspections of the State department of agriculture (E. S. R., 66, p. 386).

Of particular interest is the report of the examination of blueberries for arsenic content necessitated by the practice of dusting the fields with calcium arsenate to control the blueberry maggot. Out of 52 samples of fresh blueberries from different sections received at the station to be tested, 30 were found to contain an amount of arsenic below tolerance (0.01 grain per pound

of fruit) and 13 an amount slightly above tolerance. In the other samples the amounts varied from 2.5 to 52 times the tolerance. It is noted that all of the samples containing arsenic in amounts above tolerance were picked soon after dusting and before any rain had fallen.

The changing diet of the American people, L. B. Mendel (*Jour. Amer. Med. Assoc., 99 (1932), No. 2, pp. 117–120*).—In this lecture given before the American Medical Association at the 1932 meeting, the author traces, with numerous references to the literature from an early French treatise on foods, an English translation of which was published in 1704, to the present time, the changes which have taken place in dietary habits during this interval. Important among these changes are thought to be decreased consumption of protein, increased consumption of sugar, and the more recent increased consumption of so-called protective foods—milk, fruits, and vegetables. In closing, a note of warning against food fads is sounded as follows.

"There is no field of practical importance related to human well-being in which there is greater opportunity for dogmatism and quackery, for pseudoscience and unwarranted prescriptions and proscriptions, than in the domain of our daily diet. Those who have seen the pendulum of enthusiasm swing from one extreme food fad to another in the course of the years will be wary. Let them keep an open mind, without becoming too reactionary to notice that our food habits do change."

Influence of education on the food habits of some New York City families, L. H. Gillett and P. B. Rice (*New York: N. Y. Assoc. Improvg. Cond. Poor, 1931, pp. 48, figs. 2*).—In the hope of determining whether or not the diets of city families in the low income group have been affected by the improvement in the food habits of the country as a whole during the past few years, a study made in 1914–15 by Sherman and Gillett of the adequacy and economy of some dietaries in New York City (E. S. R., 38, p. 63) was repeated or duplicated in 1928. The results are summarized in a brief comparison of the two studies, followed by a more detailed discussion with more complete data.

The present study included 100 families which had received no direct instruction in the essentials of a proper diet and 20 families whose dietary habits had been influenced by nutrition workers. The food vaues were calculated for calories, protein, calcium, phosphorus, iron, and units of vitamins A and C and compared with those of the earlier study and with generally accepted standards. The percentage expenditures of the uninstructed families in the 1928 study approached the standard far more closely than did the corresponding group in the earlier study, showing a decided increase in the expenditure for fruits and vegetables and a decrease in that for meat and fish. The expenditure for milk and cheese, although greater than in the earlier study, was still slightly below the standard.

The expenditures for food of the families which had received some instruction were very close to the standards set. That the improvement in food selection did not involve any greater total expenditure for food, but on the contrary a lower expenditure, was shown by the fact that the average cost of foods purchased by the uninfluenced families receiving the poorer diet was 60 cts., and that of the influenced families receiving the better diet only 53 cts. per man per day.

In estimating the vitamin content of the dietaries, unit values for vitamins A and C were calculated for such foods as have been studied quantitatively. The values are discussed in terms of percentages of these vitamins derived from various types of foods and the quantity in diets of different costs, with the recommendation that adequate diets should furnish from approximately

5,000 to 10,000 units of vitamin A. "The lower concentration of vitamin A can be easily provided in low cost dietaries if the weekly grocery order contains the amounts of milk, eggs, and butter usually recommended plus either carrots, escarole, or spinach among the vegetables; or cheese or liver instead of some of the meat; or bananas or prunes among the fruits." Concerning vitamin C, 75 units is suggested as a generous allowance, with the statement that a liberal provision of vitamin C follows the inclusion of daily servings of raw, green, leafy vegetables, or of citrus fruits or tomatoes.

The basal metabolic rates of vegetarians, G. WAKEHAM and L. O. HANSEN (*Jour. Biol. Chem., 97 (1932), No. 1, pp. 155–162, fig. 1*).—In order to secure a sufficient number of lifetime or long-time vegetarians for this study the cooperation was secured of vegetarian institutions in this country, England, Switzerland, Germany, France, and Denmark. The basal metabolism determinations were carried on in a uniform manner in these different countries. For purposes of comparison data were secured on nonvegetarians in the United States and in Switzerland, using the same apparatus and technic as in corresponding determinations on vegetarians. The vegetarian subjects were staff members in the various institutions and included 6 male and 14 female lifetime vegetarians from 18 to 65 years of age. None was a vegetarian in the strictest sense, as milk was used freely and eggs occasionally by all of the subjects. Most of them, however, had never tasted flesh, fish, or fowl of any kind.

The maximum basal metabolic rate observed in the 20 lifetime vegetarians was 8 per cent and the average rate 11 per cent below the Du Bois standards. The average rate of the 5 American subjects in this group was 13.8 per cent below the Du Bois standards and 10.8 per cent below the average of 26 nonvegetarian subjects used as controls. In the group of 43 part-time vegetarians, the curve of the mean basal metabolic rates plotted against the years of vegetarianism was nearly horizontal during the first 5 years, dropped rapidly during the next 5, and was practically level again during the next 5 years. This is thought to suggest that after a period of from 6 to 8 years on a vegetarian diet there is a definite lowering of metabolism. In discussing the significance of these results, it is suggested tentatively "that the cells of the organism, confronted over a long period of time with a low supply of amino acids, gradually adjust their metabolic processes in such a way as to increase the mechanical efficiency of the body as a heat engine and thus enable the organism to carry on its normal functions with less loss of the total potential energy of the food in the form of heat."

The study of the physiological requirements of children, M. DYE (*Michigan Sta. Rpt. 1931, p. 287*).—Data are summarized briefly on 3-day dietary studies of 20 children from 2½ to 5 years of age and quantitative metabolism studies of 6 days' duration on 3 of these children on diets of low, medium, and high nitrogen and phosphorus content.

Basal metabolism of twenty-one Chinese children reared or born and reared in the United States, C. C. WANG and J. E. HAWKS (*Amer. Jour. Diseases Children, 44 (1932), No. 1, pp. 69–80*).—Data are reported and discussed with references to various standards and to values reported in the literature for adult Orientals on the basal metabolism of all but one of the 22 Chinese children reared or born and reared in the United States who were the subjects of the dietary studies by Hawks (E. S. R., 67, p. 622).

The total calories per 24 hours in the majority of cases varied with age, ranging from 844 to 1,280 for the boys and from 818 to 1,284 for the girls. With the exception of the 17-year-old girl whose metabolism was very low, all of the values were higher than the Benedict-Talbot standards. With reference to age, the minimum average percentage deviations were +6.8 for the boys and +11.5

for the girls. With reference to weight, the corresponding deviations were +16.6 and +18.5, to height +10.5 and +20.2, and to surface area +13.6 and +19.8. The values were within normal limits of the Dreyer standards.

The data were found to compare very closely with results obtained in the same laboratory on a group of American children of the same age range and degree of undernutrition (E. S. R., 56, p. 395). The study, therefore, failed to demonstrate a definitely low basal metabolism for Chinese-American children, as is reported to be the case for oriental adults. Among the possible causes suggested for this difference are the difference in climatic conditions, the difference in standards for adults and children, and the difference in the ability to relax in adults, especially oriental adults, and children.

Progress in the nutrition of infants, J. I. Durand (*Jour. Amer. Med. Assoc., 99 (1932), No. 4, pp. 275–277*).—This address, delivered before the section on pediatrics of the American Medical Association at the 1932 meeting, discusses briefly the recent changes which have taken place in the artificial feeding of infants, with resulting decrease in mortality. Among the important advances noted are the following:

Halfway measures for modifying the casein curd of cow's milk have been discarded, and boiling and acidification are followed with less emphasis than formerly on the question of the buffer substances. The discovery of vitamins has not only done away with rickets, scurvy, and xerophthalmia but has greatly improved the resistance of infants to infection. It has been recognized that "hunger is the greatest danger of the infant, and the younger the child the greater is that danger." The early broadening of the diet by the addition of egg yolk, cereals, etc., is now accepted, with resulting lessening of nutritional anemia and the building of more firm resistant tissues. Artificial diets are now constructed to furnish more nearly the optimum proportion of constituents of breast milk. There is a growing tendency to reduce milk in infant feeding to not more than a pint and to lessen the total fluids.

Attention is called to the so-called institutional diarrhea. This is thought to be due to the nervous irritation incident to life in hospital wards or institutions. It is pointed out that such a situation may also exist in private homes "where too numerous, overanxious, perhaps neurotic attendants supply the irritation." Finally, in commenting upon breast milk v. artificial feeding for infants, the author states, "I do not believe that we are likely to improve on 'nature's specific food,' as Brennemann termed mother's milk. I believe it to be of especial value in establishing the best bacterial flora in the intestine during the first days of life. But granted a skilled pediatrician to prescribe and an intelligent mother to prepare the formulas, I think that one's conscience need trouble one less than heretofore if the mother with sore nipples or an inadequate supply of milk is relieved from a long-continued unhappy effort to supply a portion of her baby's food."

Numbers and types of organisms found in certain products used in infant feeding, H. E. Mattoon (*Amer. Jour. Diseases Children, 44 (1932), No. 1, pp. 16–24*).—The 20 infant foods studied included powdered whole milks, powdered modified milks, powdered products for use in modifying cow's milk, and certain synthetic compounds, all purchased in sealed cans at local stores.

The average total colony counts on standard agar ranged from 37 to 98,000 per gram after 48 hours' incubation at 37° C. All but 6 of the samples made the standard recommended by Hucker and Hucker (E. S. R., 62, p. 392) of less than 10,000 colonies per gram. The majority of organisms found were spore-formers ranging from 7 to 29,900 per gram. Gelatin liquefiers ranged from 0 to 3,985 and chromogens from 0 to 8,900 per gram. No colon types of colonies were found.

Only one of the foods tested showed no hemolyzing colonies. The others varied in total count from 8 to 19,794 per gram. Viridans and beta hemolytic streptococci were found in 5 different products, and their presence was questionable in 2 others. In one product the count was as high as 160,000 per gram. Cultures obtained from this sample were not pathogenic for guinea pigs.

On the fatty acids essential in nutrition, III, G. O. and M. M. Burr and E. S. Miller (*Jour. Biol. Chem., 97 (1932), No. 1, pp. 1–9, figs. 5*).—In continuation of the investigation noted previously (E. S. R., 63, p. 595), various fatty acids were tested for their curative properties for the fat deficiency disease. Both linolenic and linoleic acid were effective and were of about equal value. Oleic acid and α-eleostearic acid, an isomer of linolenic acid, were ineffective. Tung oil brought about slow cures attributed to undetermined unsaturated acids. Mixtures of linoleic and linolenic esters were no more effective than either of the esters alone. A preparation of methyl arachidonate had a slight depressing effect, the reason for which was not at all clear.

Factors in food influencing hemoglobin regeneration.—I, Whole wheat flour, white flour, prepared bran, and oatmeal, M. S. Rose and E. McC. Vahlteich (*Jour. Biol. Chem., 96 (1932), No. 3, pp. 593–608, figs. 2*).—Data considered quantitatively significant are reported on the hemoglobin regenerating properties for rats rendered anemic on an exclusive diet of certified milk, of wheat in the forms of whole wheat flour, white flour, and prepared bran, and of oatmeal. The customary technic was followed, the Newcomer method being used for hemoglobin determinations, the Biazzo method as modified by Elvehjem and Lindow for copper, and the Zimmermann-Reinhardt method modified as previously described (E. S. R., 65, p. 290) for iron. Feeding of the test substances was continued for 6 weeks.

Both the whole wheat and the oatmeal in quantities of 1.5, 3, and 6 g daily (yielding 0.048, 0.096, and 0.192 mg of iron, respectively) were found to regenerate hemoglobin in proportion to the quantity fed, complete regeneration in 6 weeks occurring with 6 g of either cereal. Prepared bran fed at levels of 0.9 and 1.8 g, yielding 0.1 and 0.2 mg of iron, respectively, regenerated hemoglobin to an extent roughly proportional to the amount of iron fed. Patent flour was slightly effective, the results being better with 6 than 3 g. When 3 g of the flour was supplemented with copper and iron alone or in combination as solutions of ferric chloride and copper sulfate to equal the amounts present in 6 g of whole wheat, the hemoglobin regeneration was no better than on 3 g of the whole wheat. Iron alone gave better results than copper alone and the two together better than the iron. Supplementing 3 g of oatmeal in a similar way gave better results than were obtained with the patent flour, the regeneration of hemoglobin being practically as great as on 6 g of the oatmeal. This is thought to indicate that factors other than copper and iron, which may influence hemoglobin regeneration, were probably present in greater amounts in oatmeal than in white flour.

The extent of regeneration on the ash of 6 g. of whole wheat in hydrochloric acid solution was about the same as with the iron and copper supplements to white flour and about 30 per cent less than with whole wheat. A somewhat smaller difference was noted between the ash of 1.8 g of prepared bran and the original bran.

Iron retention by women during pregnancy, C. M. Coons (*Jour. Biol. Chem., 97 (1932), No. 1, pp. 215–226, fig. 1*).—This study forms a part of the metabolism studies of pregnant women previously noted (E. S. R., 64, p. 492). The data include 23 iron balances in 9 subjects at different stages of preg-

nancy. Iron was determined by the thiocyanate method, following the technic essentially as described by Ascham (E. S. R., 66, p. 310).

The iron intakes ranged from 9.69 to 19.45 mg per day and the retentions from +0.88 to +6.97 mg, with the one exception of a negative balance of —2.21. High storage rates occurred early in pregnancy, with a tendency to lower ones during the last months. Individual differences in retention could be traced partly to special circumstances, such as a high storage rate in one subject following recovery from a period of nausea and semistarvation and the only negative balance in one subject following digestive disturbances, and partly to differences in the diet. An abundance of eggs and green vegetables in the diet of one of the subjects was associated with relatively high storage. In another subject the best retention occurred in a period when the diet was most adequate in eggs, green vegetables, and meat. Two subjects who had an abundance of meat and liver, with a reasonable amount of green vegetables but a low intake of milk, had relatively high iron and low calcium retention.

These variations in iron retention with variations in the diet are thought to indicate that under fairly ideal conditions it is possible for the maternal organism to assimilate during the period of pregnancy enough iron from the food to supply the newborn infant with the needed reserves. Comparing the iron retention with reported values for the iron content of the newborn, it is thought that in the present study only the best diets were supplying the iron demands of pregnancy.

Is erythropoietic action of copper dependent upon presence of adequate supply of iron in diet? H. B. Stein and R. C. Lewis (*Soc. Expt. Biol. and Med. Proc., 29 (1932), No. 9, pp. 1174, 1175*).—In a study of the effect of evaporated milk upon the development of nutritional anemia in the rat, it was found that although the hemoglobin of the blood fell slowly with prolonged feeding of the milk the erythrocytes were maintained at a normal level during the 8 weeks' experimental period in contrast with a decrease in both hemoglobin and erythrocytes in rats receiving raw milk. To determine whether or not the difference was due to copper dissolved in the milk during the manufacturing process, a similar test was carried on with rats fed raw milk supplemented with 0.025 mg of copper daily. At the end of 8 weeks the erythrocyte count was higher than in the animals receiving raw milk alone, although not quite as high as in those receiving evaporated milk. This is thought to indicate that the maintenance of a normal erythrocyte count on evaporated milk is due in part at least to the copper content of the milk.

[Significance of manganese, copper, and zinc in nutrition] (*Kentucky Sta. Rpt. 1931, pt. 1, pp. 24, 25*).—A method of determining, by the growth of plant materials in nutrient solution and testing on growing rats, which of the less common elements have important functions in the growth of plants and the production of foods of good quality is described, with a summary of the results obtained for manganese.

A preliminary report is given of the growth of yeast cells on a medium deficient in manganese, copper, and zinc as compared with the growth on a medium containing optimum amounts of these elements.

Mottled enamel in Arizona and its correlation with the concentration of fluorides in water supplies, H. V. and M. C. Smith (*Arizona Sta. Tech. Bul. 43 (1932), pp. 213–287, pl. 1, figs. 3; abs. in Jour. Dental Research, 12 (1932), No. 3, pp. 554–556*).—The investigation noted previously (E. S. R., 65, p. 596) has been extended to a survey of the entire State of Arizona for the extent of mottled enamel in the permanent teeth of school children and to analyses of the drinking water of the communities where the tooth examinations

were made. The method used in the fluoride determinations was that of Fairchild, noted on page 293, with certain modifications which are described in detail. An individual report is given of the findings in each of the communities investigated, including the location and population of the community, the extent and degree of mottled enamel, and the source and analysis of the drinking water.

Mottled enamel, varying in degree from mild to severe, was found in about 45 towns or rural districts in the State. In communities where there was no mottled enamel, the fluoride content of the drinking waters did not exceed two parts per million. Concentrations of from two to three parts per million appeared to be on the border line of safety, the extent of mottled enamel varying from no mottling in about 50 per cent of the cases to mild and in some instances more severe mottling. Concentrations of from about three to five parts per million were associated with mottled enamel varying in degree from mild to moderately severe, and concentrations in excess of five parts per million with mottled enamel of the moderately severe and severe types.

Differences in fluoride concentration could not be correlated with differences in the depth of the water supply or type of well. In some communities water from one source contained fluorides and from another source did not.

It is pointed out in conclusion that "elimination of this distressing and disfiguring tooth defect is a matter of prevention which can at this time be accomplished only by a change in the water supply of the afflicted communities to one which does not contain toxic concentrations of fluorides. Unfortunately, this is not easily possible in every section and a great economic problem is involved. Methods of treatment of public water supplies for the removal of toxic concentrations of fluorides are now being investigated in this laboratory."

[Present status of the knowledge of vitamins] (*Jour. Amer. Med. Assoc., 98 (1932), Nos. 23, pp. 1981–1987; 24, pp. 2054–2060; 25, pp. 2201–2208; 26, pp. 2282–2288; 99 (1932), Nos. 1, pp. 26–31; 2, pp. 120–124; 3, pp. 215–222; 4, pp. 301–309; 5, pp. 384–388; 6, pp. 469–475*).—The critical reviews noted below were prepared under the auspices of a committee consisting of M. Fishbein, chairman, L. B. Mendel, and J. Hess, representing a joint committee of the council on pharmacy and chemistry and the committee on foods of the American Medical Association. Vitamin A, by L. B. Mendel (vol. 98, pp. 1981–1987); Clinical Features of Vitamin A Deficiency, by G. B. Eusterman and D. L. Wilbur (pp. 2054–2060); Review of Recent Studies on the Antineuritic Vitamin—Its Chemical and Physiologic Properties and the Effects of Its Deprivation on the Animal Body, by H. D. Kruse and E. V. McCollum (pp. 2201–2208); Vitamin B_1 in Relation to the Clinic, by G. R. Cowgill (pp. 2282–2288); The Present Status of Vitamin B_2 (G)—Historical Survey, by B. Sure (vol. 99, pp. 26–31); Clinical Aspects of Vitamin G Deficiency, by F. P. Underhill (pp. 120–124); Vitamin D, by R. C. Clouse (pp. 215–222, 301–309); The Clinical Significance of Vitamin D in Infancy and Childhood, by F. W. Schlutz (pp. 384–388); and Vitamin E, by H. McL. Evans (pp. 469–475).

The previously noted paper by Hess on recent advances in knowledge of scurvy and the antiscorbutic vitamin (E. S. R., 67, p. 491) is also a part of this series.

Vitamin investigations (*Idaho Sta. Bul. 192 (1932), p. 32*).—This progress report includes brief summaries of a continuation of the studies on the vitamin C content of the Idaho Burbank and other varieties of potatoes (E. S. R., 66, p. 298) and of preliminary work on the vitamin G content of potatoes and the vitamin A content of pasture grasses.

The vitamin A, B, C, and G content of Concord grapes, E. P. Daniel and H. E. Munsell (*Jour. Agr. Research [U. S.], 45 (1932), No. 7, pp. 445–448.*

figs. 3).—Following the same methods as in an earlier study of other varieties of grapes (E. S. R., 66, p. 896), the authors have found that Concord grapes (*Vitis labrusca*) contain a very small amount of vitamin A, barely detectable amounts of vitamin B, and no detectable amounts of vitamin C or G. It is suggested that the greater content of vitamins A, B, and C in the edible portions of Malaga (seeded) and Sultanina (whole) grapes and the presence of vitamin G in the latter may be accounted for by a greater concentration of vitamins in the skins which were retained in these varieties but discarded in the Concord grapes.

Production of vitamin A by a species of Corynebacterium, C. E. Skinner and M. F. Gunderson (*Jour. Biol. Chem., 97 (1932), No. 1, pp. 53–56, fig. 1*).—Dried bacteria of a species of Corynebacterium grown on a vitamin A-free medium in total darkness cured xerophthalmia in young rats very promptly, and induced slight but definite growth when fed daily in 1-g amounts as a supplement to a vitamin A-free diet. Larger amounts were not consistently consumed. It is noted that the organism has an orange color, but tests for carotene were not made.

Processed ripe and green olives for vitamin A, H. B. Kifer (*Fruit Prod. Jour. and Amer. Vinegar Indus., 11 (1932), No. 12, pp. 370, 371, fig. 1*).—In studies at the Bureau of Home Economics, U. S. D. A., canned ripe olives of the Manzanillo variety were found to have a vitamin A value of approximately 70 units per ounce, but to have no detectable amounts of vitamins B, G, C, and D. Canned green olives of a well-known brand purchased on the Washington market proved to be as rich in vitamin A as the Manzanillo ripe olives, but ripe olives of the Mission variety were only about half as rich in vitamin A.

Ferrous iodide as a substitute for vitamin A in rats, H. C. Cameron (*Science, 76 (1932), No, 1957, pp. 18, 19*).—A repetition of the experiments of Chidester et al., from which the conclusion was drawn that small doses of sirup of ferrous iodide can take the place of vitamin A in the cure of xerophthalmia and promotion of growth in rats (E. S. R., 60, p. 853), is reported.

In the curative tests conducted on 45 rats, the ferrous iodide treatment in a few cases appeared to exert a temporary inhibiting effect on bleeding about the eyes, but the bleeding always reappeared and xerophthalmia progressed through the usual course. The treatment had no effect on the incidence of terminal infections of the glands about the mouth. Death was hastened by an average of 12 days, and the food consumption was decidedly less than normal. In the prophylactic tests on 18 rats, the treatment had no effect on the incidence of terminal infections of the glands about the mouth nor on the incidence or course of xerophthalmia, although it did delay the onset of xerophthalmia and loss of weight and death. It also increased the food consumption.

The administration of ferrous iodide and linoleic acid to rats deprived of vitamin A, L. L. Reed, L. B. Mendel, and H. B. Vickery (*Science, 76 (1932), No. 1970, pp. 300, 301*).—Evidence is summarized indicating that, contrary to the results reported by Chidester et al., but in harmony with those of Cameron noted above, "the administration of ferrous iodide and linoleic acid, alone and in combination, was ineffective as a cure for xerophthalmia, as a stimulant to growth, or as a preventive of infection or renal disturbance in rats deprived of vitamin A."

In explanation of the findings of Chidester et al., the authors expressed the opinion that their experimental conditions were not in accordance with the accepted standards of modern vitamin testing. Possible objectionable factors in their technic include vitamin A in the diet in small amounts, large stores of vitamin A in the rats at the beginning of the experiment, and simultaneous

depletion of the animals of vitamins A and D. It is thought that some or all of these factors "seem to have resulted in a stunted nonreactive animal which could not be expected to give the clear-cut responses required in vitamin work."

Ferrous iodide and linoleic acid in vitamin A deficiency. A reply to certain criticisms, F. E. CHIDESTER (*Science, 76 (1932), No. 1976, pp. 436, 437*).—A reply to the paper noted above.

The relative quantities of the heat-stable and heat-labile fractions of vitamin B in raw and evaporated milk, L. T. SAMUELS and F. C. KOCH (*Jour. Nutrition, 5 (1932), No. 3, pp. 307–324, figs. 9*).—In this quantitative comparison of raw and evaporated milk for their content of the heat-labile and heat-stable fractions of vitamin B commonly referred to as vitamins B and G, an extract prepared from yeast by the Kinnersley-Peters method was used as the source of vitamin B in the vitamin G experiments and Fleischmann's starch-free yeast, dried and autoclaved at 15 lbs. pressure for 4 hours, as the source of G in the vitamin B experiments.

An attempt was first made to separate the two factors from raw certified milk by alcohol fractionation of the milk solids. This separation gave positive evidence of the two fractions in the milk, but involved too great losses to be used for quantitative work. Fresh milk was then used to determine which of the two vitamins was the limiting factor. After growth had ceased on 15 c c of the milk daily, autoclaved yeast was without effect, but the Kinnersley-Peters extract brought about resumption of growth at a normal rate. These findings confirm the conclusions of Macy et al. (E. S. R., 57, p. 390) and of Hunt and Krauss (E. S. R., 60, p. 694) that the limiting factor in milk is the antineuritic vitamin.

In the quantitative comparison of vitamin B in fresh and evaporated milk, milk of the same lot as that used for the preparation of the evaporated milk was kept in frozen storage until required. Tests of the frozen milk after 6 months' storage at —4° C. showed that the vitamin B content had not been lowered appreciably. Three methods were followed in the comparison. In the first the evaporated milk diluted with an equal quantity of distilled water and the raw milk were fed in the same graded quantities as the sole source of vitamin B, with 0.5 g of the autoclaved yeast as the source of vitamin G. In the second, all groups were fed the two kinds of milk at the same low level, 15 c c daily, supplemented with varying quantities of an accurately standardized antineuritic vitamin B concentrate. In the third the effectiveness of the two forms of milk for lactation was tested by a method very similar to that described by Sure (E. S. R., 61, p. 696). The results obtained by the three methods were consistent in showing that commercial evaporation destroys about one-sixth to one-fifth of the antineuritic heat-labile vitamin B, and that all cows' milk is low in this vitamin. For optimum growth as much as 25 c c (3.49 g) of the milk was required per rat per day. No wide variation in the vitamin B content was observed in the different supplies of milk.

In the vitamin G tests only the first of the three methods was used. The technic was similar to that of Aykroyd and Roscoe (E. S. R., 62, p. 194) except that the growth periods were longer, parallel controls were always run, and the rats were carefully matched. The growth records confirmed the evidence of various investigators that the heat-stable fraction contains more than one vitamin, but showed no differences between the evaporated and the raw milk. The quantity of milk necessary for optimum growth, while smaller than that required for vitamin B, was fairly large, from 17 to 20 c c per rat per day. Concerning the relation of pellagra to the heat-stable fraction, it is noted that in many cases skin symptoms appeared during the period of rapid growth. In

the authors' opinion, "the question of the identity of this heat-stable factor with the antipellagra fraction is still unsettled."

The general conclusions concerning the value of milk as a source of the factors comprising the vitamin B complex are as follows: "The results in the growth experiments show that milk contains all the water-soluble vitamins necessary for the growth of the rat, but that relatively large volumes must be taken to obtain optimum growth. Commercial evaporation has not seriously affected these substances. The small destruction in the case of the antineuritic fraction is probably in large part due to the process of sterilization in which temperatures above 100° are maintained for some time. Undoubtedly it is wise to include other sources of these vitamins in all infant dietaries."

Studies in the physiology of vitamins, XIX, XX, E. Burack and G. R. Cowgill (*Jour. Biol. Chem., 96 (1932), No. 3, pp. 673–696, figs. 3*).—A continuation of the series noted previously (E. S. R., 67, p. 633).

XIX. *The acid-base balance of the blood during lack of undifferentiated vitamin B* (pp. 673–684).—Evidence is presented indicating that in dogs on a diet deficient in the vitamin B complex no significant alterations in the concentrations of serum electrolytes take place provided food consumption is maintained. In dogs which refuse to eat, changes similar to those taking place in simple inanition occur.

"In general the results of the investigation indicate that it is difficult to bring about a condition of acidosis in the dog either by simple fasting or by lack of undifferentiated vitamin B. Shortage of this dietary factor is not primarily responsible for any characteristic changes in the acid-base balance of the blood."

XX. *The glucose tolerance during lack of undifferentiated vitamin B* (pp. 685–696).—The conflicting literature concerning the relation of vitamin B to carbohydrate metabolism is reviewed, and a series of glucose tolerance experiments on dogs is reported with paired controls to make allowance for the evidence of concomitant fasting.

A definite decrease in glucose tolerance was exhibited by both the vitamin B-deficient animals and the controls, the degree of disturbance in both cases being directly proportional to the severity of the fasting. In two experiments the vitamin B concentrate administered was prepared by the method of Block and Cowgill (E. S. R., 67, p. 503) and was practically free of carbohydrate. It was administered by intravenous injection into dogs showing the characteristic nervous manifestations of vitamin B deficiency. Although these symptoms were promptly relieved, there was no change in the glucose tolerance until after the ingestion of food, when the tolerance increased to normal levels.

"It is concluded that the decrease in carbohydrate tolerance shown by animals deprived of vitamin B is the result of the accompanying inanition. The view that vitamin B plays a specific rôle in the metabolism of carbohydrate is not supported by this investigation."

Avitaminosis, IV, V (*Arch. Int. Med., 49 (1932), No. 3, pp. 397–408, figs. 6*).—In continuation of the series of studies noted previously (E. S. R., 66, p. 492), two papers are presented.

IV. *The effect of a deficiency of the vitamin B complex on the lipid metabolism and glycogen content of the liver of the albino rat,* B. Sure and M. E. Smith (pp. 397–404).—This is the complete report, with experimental data, of a study of which the previous paper in the series constituted a preliminary report.

V. *The specific effect of vitamin B deficiency on the differential count of the albino rat,* B. Sure and D. J. Walker (pp. 405–408).—Evidence is presented,

indicating that the lymphopenia and corresponding polymorphonuclear leucocytosis previously noted as occurring in uncomplicated vitamin B (B plus G) deficiency and tentatively attributed to inanition (E. S. R., 65, p. 495), are the manifestations of a deficiency of vitamin B per se (B_1).

The procedure consisted in studying three groups of litter-mate rats of the same sex in sets of four. The first animal was given a diet satisfactory in every known respect with the exception of vitamin B, vitamin G being furnished by 10 per cent autoclaved dehydrated yeast. The second received the same quantity of the same diet and water as the first with the exception that untreated yeast, furnishing an abundance of both vitamins B and G, replaced the autoclaved yeast. The third received the same quantity of the same diet as the second except that the water was allowed ad libitum, and the fourth the same diet as the second, but unrestricted in amount with water ad libitum. Changes in the polymorphonuclear and leucocyte counts occurred only in the first group.

Effect of lead arsenate spray on the composition and vitamin content of oranges, E. M. Nelson and H. H. Mottern (*Amer. Jour. Pub. Health, 22 (1932), No. 6, pp. 587–600, fig. 1*).—This contribution from the U. S. D. A. Bureau of Chemistry and Soils reports chemical analyses and vitamin C assays of Florida Valencia oranges from trees sprayed with lead arsenate and nonsprayed trees, and of processed and nonprocessed fruit from both. The processing of the fruit was carried out in accordance with the regulations of the Plant Quarantine and Control Administration and consisted in heating the fruit to 110° F. for a period of 8 hours to destroy larvae of the Mediterranean fruit fly.

The processing was found not to change the character of the sugars, citric acid, and vitamin C content of the fruit, but spraying the trees with lead arsenate altered the composition of the fruit. The most pronounced change was a reduction in the acidity of the juice. There was also a decrease in the sucrose and a corresponding increase in the invert sugar content. There were no differences in the total ash or alkalinity of the ash. The arsenic content of the edible portion of the fruit was not increased by spraying the trees even with heavy doses of lead arsenate.

The vitamin C content of the sprayed fruit was much lower than of the unsprayed. In heavily sprayed fruit the potency was decreased from one-third to one-half. Inasmuch as the ratio, Brix: acidity, obtained by dividing the percentage of total soluble solids by the percentage of citric acid, was higher in the sprayed than the unsprayed fruit, the possibility of using this ratio as a measure of the vitamin C content of oranges is suggested. It is noted also that as this value normally increases as the fruit ripens, the maturity standards based on this ratio are not reliable for sprayed fruits. "This fact has been taken advantage of by unscrupulous fruit growers to market their fruit early in the season when better prices may be obtained."

Vitamin C content of Orange-Crush beverage, E. M. and F. C. Koch (*Indus. and Engin. Chem., 24 (1932), No. 3, pp. 351, 352*).—This study was undertaken to determine what effect the processes of preparation, mixing, and storage have upon the vitamin C content of orange juice as used in the manufacture of this commercial beverage. The materials tested included unstrained orange juice pressed from freshly gathered oranges; Crush sirup made from this juice by the addition of sugar, lemon citric acid, and small amounts of sodium benzoate and color; and bottled Orange Crush prepared by dilution of the sirup with carbonated tap water. These were tested when freshly prepared and after storage for 3 months at refrigerator temperature, and in addition oranges and orange juice frozen within 48 hours after expressing and stored in the frozen state were also tested after 3 months.

The orange juice and the carbonated beverage lost their antiscorbutic potency very rapidly. Whole oranges and the orange sirup retained their potency practically undiminished during the entire storage period, but the frozen orange juice lost its potency. When the same dilution of sirup was made in the laboratory with a minimum opportunity for exposure to air and room temperature and the product was tested after storage for 10 days, there was no detectable loss of antiscorbutic potency. "It appears, therefore, that a maximum interval of 10 to 14 days between dilution and consumption of the finished product assures the presence of antiscorbutic potency in Orange Crush as it is dispensed to the public." The dilution of the orange juice is such that 21 c c of the final product contains 1 c c of the original juice.

The anemia of scurvy.—Effect of vitamin C diet on blood formation in experimental scurvy of guinea pigs, S. R. METTIER and W. B. CHEW (*Jour. Expt. Med., 55 (1932), No. 6, pp. 971–979, pl. 1, figs. 2*).—A study is reported of the changes in the blood and the condition of the bone marrow at autopsy in guinea pigs on a scorbutic diet, in some cases supplemented with orange juice after the onset of scurvy. During the progress of the disease losses in weight, progressive anemia, and a moderate increase in reticulated red blood cells occurred. The bone marrow of the scorbutic animals showed large numbers of erythrogenic cells, with little evidence of active maturation to adult erythrocytes. In the animals given orange juice after the onset of symptoms, there was a reticulocyte response. The bone marrow of such animals showed relatively more adult red blood cells than that of untreated scorbutic guinea pigs. "It is concluded from this study that the anemia of experimentally induced scurvy in the guinea pig is largely dependent upon vitamin C deficiency, resulting in retarded maturation of the red blood cell."

The question of synthesis of the antirachitic vitamin by the cod, A. F. HESS, C. E. BILLS, M. WEINSTOCK, and M. IMBODEN (*Soc. Expt. Biol. and Med. Proc., 29 (1932), No 9, pp. 1227, 1228*).—In this preliminary report it is noted briefly that in experiments carried on several years ago and not reported hitherto the livers of cod which had been given by means of a pipette at 2-day intervals five feedings of 10 mg each of nonirradiated ergosterol showed no higher content of vitamin D in the liver when killed and tested 36 hours after the last feeding than control fish kept under the same conditions but without ergosterol. In a more recent experiment similar negative results were obtained when the fish were given ergosterol by intramuscular injection.

"These experiments furnish no evidence that ergosterol, whether given by mouth or intramuscularly, is utilized by the cod in the elaboration of vitamin D, but do not preclude the ability of these fish to synthesize this vitamin under different conditions."

Studies on vitamin E, I–IV [trans. title], A. JUHÁSZ-SCHÄFFER (*Arch. Path. Anat. u. Physiol. [Virchow], 281 (1931), No. 1, pp. 3–34, figs. 15; 35–45, figs. 2; 46–52; 53–65, figs. 5*).—An extensive investigation of the effects of vitamin E deficiency on rats is reported in four pages.

I. *Alterations in the reproductive organs during E avitaminosis.*—This study of the functional and morphological effects of vitamin E deficiency was conducted on 52 male (34 experimental and 18 control) and 37 female (23 experimental and 14 control) rats, some of which were albino and some mixed black and white. Four diets were used, including the basal vitamin E-free diet of Evans (E. S. R., 58, p. 595), two others containing wheat starch, casein, fat, salt, cod-liver oil, and yeast in varying proportions, and one containing milk powder in addition to these ingredients. The controls receiving any of these diets plus from 1 to 3 drops of wheat germ oil per rat per day grew at a some-

what lower rate than normally fed rats. The omission of the wheat germ oil did not alter this growth rate appreciably.

All of the diets without the wheat germ oil caused 100 per cent sterility in the males. The testicular changes, which are illustrated by microphotographs, were in general agreement with those described by Mason (E. S. R., 55, p. 194), although the various stages or phases of the testicular degeneration did not correspond exactly with those as described by Mason. In the female rats, the fertility was 65 per cent in the first two months and then fell to 20 per cent in the following two months, and after that to zero. The young born in the first month died soon after birth and those in the next two months were born dead. Histological examination of the ovaries showed no abnormality.

II. *Action of vitamin E on in vitro transplants.*—An ether extract of wheat germ oil was found to have a stimulating effect upon the growth of cultures of tissues of 5- to 15-day-old chicken embryos in a medium containing plasma from a year-old hen, but without embryonal extract. The oil inactivated as to vitamin E by sterilization was without effect. This is thought to suggest the possibility that vitamin E plays a rôle in cell multiplication.

III. *Experiments on the question of "ex non usu."*—The problem of storage of surplus vitamin E was investigated in two ways: (1) By gradually reducing the amount of vitamin E furnished in food until the animals were subsisting on a vitamin E-free diet and examining the testes from time to time, and (2) by feeding an excess of vitamin E over a considerable period of time and then removing it from the diet and continued examination of the testes. In the first series it was found that after 120 days on a vitamin E-free ration the final stage in the degeneration of the testes was reached. In the second after the same length of time on the vitamin E-free diet the changes were not so complete, resembling the ordinary picture of E avitaminosis at the end of the fifth to the tenth week. This is thought to indicate that considerable excess of vitamin E may be stored in the body.

IV. *Studies on the vitamin content of the feces.*—Rats were fed a synthetic diet containing 10 per cent of the feces of other rats that had been fed (1) an excess of vitamin E, (2) 1 or 2 drops of wheat germ oil as the source of vitamin E, and (3) a vitamin E-free diet. The rats in the first group only were protected from vitamin E deficiency. This is thought to indicate that when vitamin E is fed in excess a part of it is excreted in the feces.

[Studies on nutritional anemia], O. Sheets (*Mississippi Sta. Rpt. 1932, pp. 32–34*).—A progress report on the investigation noted previously (E. S. R., 66, p. 793).

Dietary practices in relation to the incidence of pellagra.—I, A study of family dietaries in Leon County, Florida, M. R. Sandels and E. Grady (*Arch. Int. Med., 50 (1932), No. 3, pp. 362–372, fig. 1*).—This paper reviews briefly the more important literature dealing with the relation of diet to pellagra, and reports a study of family dietaries in Leon County, Fla., undertaken with the hope of securing information concerning a seasonal variation in the diets of pellagrous families and any important differences in the choice of foods by this group as compared with nonpellagrous families.

Sixteen families in which one or more active cases of pellagra existed and 13 families of similar occupational level who were free from the disease cooperated in the study. Dietary records to the number of 93, each covering a period of 7 days, were collected from these families at four different seasons, midwinter, spring, late summer, and fall. These records were analyzed for total calories and grams of protein per adult male unit per day by seasons for the pellagrous and nonpellagrous families and for the seasonal percentage distribution of total calories among the important food groups.

The total calories were liberal and the total protein within normal limits in both groups. There were significant differences in favor of the nonpellagrous group in the consumption of milk and succulent vegetables, particularly in the fall and winter diets, with some indication of a more liberal consumption of eggs, cheese, and fruits. The consumption of lean meat and fish was similar in both groups.

These findings are considered to confirm reported observations of previous investigators of an inverse relationship between the use of milk and succulent vegetables and the incidence of pellagra, and to extend these findings in showing a greater seasonal variation in the use of these foods by pellagrous than nonpellagrous families. "A study of 29 families is too limited in scope to warrant generalizations. The results, however, would seem to justify emphasis, in practical dietary recommendations, on the need for an increased use of succulent vegetables during the months when garden produce is less plentiful and for the establishment of a uniformly liberal milk supply throughout the year."

Food supply and pellagra incidence in 73 South Carolina farm families, H. K. Stiebeling and H. E. Munsell (*U. S. Dept. Agr., Tech. Bul. 333 (1932), pp. 36*).—"The investigation included the collection of information regarding the food used by 73 farm families in Lee County, S. C.; the evaluation of the food supply in terms of its adequacy for good nutrition; periodic examinations of members of the cooperating families for symptoms of pellagra; and a study of the relation of the food supply to pellagra incidence. The food habits of the families successful in warding off pellagra, as well as those of the families succumbing to the disease, were carefully observed, and nutrition demonstrations were conducted in which pellagra-preventing food materials were furnished to certain families."

The diets in the early spring of the families in which one or more members showed symptoms of pellagra in the late spring consisted largely of breadstuffs, sweets, and fats, and were consequently low in calcium, iron, and vitamins A and C, and very deficient in the pellagra-preventing factor as calculated from data given in publications of the U. S. Public Health Service (E. S. R., 67, p. 488). The diets of the families which were successful in warding off pellagra were more abundant in all these factors. The food showing the greatest difference between the two groups was milk, the average per capita consumption of which during the late winter and spring was 2.26 cups in 14 families in which only 2 cases of pellagra developed among 63 individuals, as compared with 0.18 cup in 13 families in which 29 cases of pellagra developed among 69 individuals.

In 44 families supplied with one of six pellagra-preventing food materials during the early spring, pellagra was reduced below previous years to such an extent as to lead to the conclusion that "the addition of 2 to 4 oz. of dry skim milk or 1 lb. of evaporated milk, or 1 to 2 oz. of wheat germ, or 1½ pints of canned tomatoes, or ½ lb. of cured lean pork, or 1 oz. of pure dry yeast per person per day to the food supply customarily used in winter and early spring suffices to reduce greatly the incidence of pellagra among families which in times of stress subsist on a very monotonous and one-sided diet containing very little milk, lean meat, fish, or eggs."

Calculations from prevailing retail prices of the average money values of the diets during April or May of a group of 13 families whose diets were pellagra-preventing during the year and the same number of families whose diets were not pellagra-preventing gave values of 22.13 and 11.85 cts., respectively, as compared with 28.62 cts. for the low cost adequate dietary recommended by Stiebeling and Birdseye (E. S. R., 65, p. 192).

The prevalence of pellagra among the unaided families appeared to be related to their supply of home-produced food. Over half of the 14 unaided families among whom pellagra was not observed owned cows, raised hogs for food, and had vegetable gardens, while of the 59 other families only one-fourth had cows, one-half swine, and one-half gardens. It is thought that the families cooperating in this study could afford diets furnishing throughout the year at least minimum quantities of protective foods only through a carefully planned program of home food production and conservation.

Asthma from food odors, S. M. Feinberg and P. L. Aries (*Jour. Amer. Med. Assoc., 98 (1932), No. 26, pp. 2280, 2281*).—Three case reports are given of attacks of asthma induced by the odor during cooking of foods to which the patients reacted by the usual tests. In one case the offending material was shrimps and in the other two peas, beans, and lentils. The reactions are attributed to volatile substances given off by the offending foods during cooking. It is thought that attention to the likelihood of food odors as factors in sensitization may clear up some of the food sensitive cases that have not responded to the elimination of the suspected food from the diet.

A technique for studying the metabolism of rats, V. Korenchevsky and M. Denison (*Biochem. Jour., 26 (1932), No. 1, pp. 147–150*).—A detailed description is given of the technic which the authors have developed to obviate the many difficulties involved in determining the metabolism of rats.

A convenient feed cup for rats, R. W. Pilcher (*Indus. and Engin. Chem., Analyt. Ed., 4 (1932), No. 3, p. 327, fig. 1*).—The feeding cup described and photographed is made from two tin cans of such relative dimensions that one will readily fit into the other without binding. The cans are cut to approximately the same height on a lathe or by means of tin shears, and a round hole of sufficient size to permit easy entrance of the rat's head is cut in the end of the smaller can. The feed is put in the larger can, and the smaller can is inverted and forced down into position inside the larger. The cup may be suspended from the top of the cage by wires or fastened to the side. In the latter case it is suggested that it be placed at an angle from the side of the cage to prevent the possibility of excreta lodging in the cup.

A balance for live animals, B. F. Crocker and H. Wasteneys (*Science, 75 (1932), No. 1954, p. 614, fig. 1*).—This apparatus, a diagram for which is presented, involves the addition of a simple attachment to a commercial beam balance of 1 kg capacity, reading directly from 0 to 100 g in 1-g intervals. In the original balance the oscillations of the beam are damped by a paddle attachment immersed in oil. The additional attachment consists of a paddle immersed in oil which is attached to the underside of a cup-shaped scale pan. The attachment is said to dampen successfully the sideways or rotatory oscillations caused by the movement of the animal in the pan.

TEXTILES AND CLOTHING

Textile research, compiled by U. S. Institute for Textile Research (*Cambridge: Mass. Inst. Technol., 1932, pp. XXI+264, figs. [16]*).—A memorial to the late Samuel W. Stratton, this book comprises the following articles reviewing progress in the several fields of textile research: Physical Testing, by H. J. Ball (pp. 1–23); Chemical Analysis, by J. F. X. Harold (pp. 24–48); Dye Chemistry and Application, by L. A. Olney (pp. 49–64); Application of Optical Equipment to Textile Research, by E. R. Schwarz (pp. 65–74); Textile Microbiology, by B. E. Proctor and W. G. Chace (pp. 75–86); Technology of Cotton Manufacture, by H. H. Willis (pp. 87–97); Cotton Fiber Research, by

R. K. Worner (pp. 98–110); Drycleaning, by P. B. Mack (pp. 111–122); Technology of Woolen and Worsted Manufacture, by E. D. Fowle (pp. 123–135); Wool Fiber Research, by J. I. Hardy (pp. 136–145); The Laundry Industry, by G. H. Johnson (pp. 146–153); Technology of Silk Manufacture, by W. F. Edwards (pp. 154–161); Silk Fiber Research, by W. M. Scott (pp. 162–169); Textile Machinery Design, by G. B. Haven (pp. 170–177); Technology of Rayon Manufacture, by A. K. Johnson (pp. 178–183); Rayon Fiber Research, by H. DeW. Smith (pp. 184–202); Technology of Finishing, by W. H. Cady (pp. 203–211); Technology of Bast Fiber Manufacture, by S. J. Hayes (pp. 212–222); Bast and Hard Fiber Research, by L. H. Dewey (pp. 223–227); Asbestos Textile Industry, by J. M. Weaver (pp. 228–234); Economic Research, by H. V. R. Scheel (pp. 235–245); and Consumer Specifications for Textile Products, by L. R. Gilbert (pp. 246–254). An index of abstracts and bibliography in Vol. I of the Official Bulletin of United States Institute for Textile Research, Inc., compiled by C. H. Clark, is appended.

Textile analysis, S. R. and E. R. Trotman (*London: Charles Griffin & Co., 1932, pp. [3]+301, figs. 57*).—This book treats of the identification and determination of textile fibers; physical tests for textile materials; determination of specific gravity and viscosity; standard volumetric solutions; analysis of organic compounds; acids; indicators and their hydrogen-ion concentrations; alkalies; bleaching agents; water and effluents; analysis of fibers; oils; organic solvents; formaldehyde, tannins, bluing agents, and glycerol; starch, dextrin, glue, gelatin, casein, and vegetable gums; metallic salts; nitro-compounds, amines, and phenols; and the detection and analysis of dyestuffs.

Medulla in wool, B. L. Elphick (*New Zeal. Jour. Agr., 42 (1931), No. 2, pp. 91–98, figs. 4*).—In this paper from the Massey Agricultural College the author describes a method of testing for medulla in wool. The test consists of washing the wool sample in gasoline to remove dirt and grease, combing out the sample with the fingers, and immersing it in benzol in a testing tray with a black background. A glass plate is then placed over the sample. When viewed from above the wool fibers, while not actually invisible, have a silky transparent appearance, but the medullated fibers are bright and chalky and are easily distinguished.

HOME MANAGEMENT AND EQUIPMENT

Comparison of two scales for measuring the cost of value of family living, E. L. Kirkpatrick and E. G. Tough (*Amer. Jour. Sociol., 37 (1931), No. 3, pp. 424–434*).—The Zimmerman adult equivalent scale (E. S. R., 61, p. 85; 62, p. 389) and the Kirkpatrick cost-consumption unit scale (E. S. R., 50, p. 294; 54, p. 885) are compared, using the 104 white village family summaries in the Crozet, Va., survey noted below, 71 of the same summaries, the 33 extreme cases being omitted, and 131 summaries—every seventh summary of 900—in a farmer's standard of living study being conducted in Wisconsin.

Three sets of Pearsonian coefficients of correlation were computed, as shown by the following table:

Coefficients for different variables

Dependent variables for different groups of families	Expenditures per adult male equivalent (X_1)	Sum of expenditures per cost-consumption unit (X_2)	Total expenditures per family (X_3)
Expenditures per adult male equivalent (X_1):			
104 village families	----------	0.93	----------
71 village families [1]	----------	.90	----------
131 farm families	----------	.89	----------
Total expenditures per family (X_3):			
104 village families	0.57	.88	----------
98 village families [1]	.36	.72	----------
131 farm families	.52	.84	----------
Gross cash income per family:			
131 farm families (X_4)	.44	.67	0.59

[1] Village families with extreme cases omitted.

The authors conclude that while the adult male equivalent is the more readily applied, the greater exactness of the cost-consumption unit method gives a feeling of more certainty. The difference of the means for the two units, which is 4.52 times the standard error, shows a significant difference between the means obtained by the two methods.

Standards of living in the village of Crozet, Virginia, E. L. Kirkpatrick and E. G. Tough (*Va. Univ. Rec., Ext. Ser., 16 (1931), No. 2, pp. 40, pls. 3, figs. 7*).—This study of family standards of living and the relation between such standards and social activities is based upon data for the year 1929–30 obtained by the survey method from 104 white and 24 negro families. The village, its population, trade facilities, social, religious, and economic organizations and institutions, etc., are discussed. Tables and charts are included showing for the white families grouped as poor, intermediate, and prosperous the average amounts and distribution of expenditures for the principal groups of goods and services. Comparisons are made with the findings of Gee and Stauffer in the study of rural and urban living standards in Virginia (E. S. R., 62, p. 581). Tables and charts are also included showing for the negro families the average value of the principal groups of goods and services, and making comparisons with the findings of Kirkpatrick and Sanders in the study of the cost of living among colored families in Kentucky, Tennessee, and Texas (E. S. R., 52, p. 791).

The social institutions and agencies of the village, the churches, the local government situation, and the voluntary organizations are discussed as factors determining the standards of living of the village.

The standard of living on specific owner-operated Vermont farms, M. Muse (*Vermont Sta. Bul. 340 (1932), pp. 54, figs. 8*).—The data analyzed for this bulletin were obtained from carefully itemized accounts kept by 58 home makers for 1 year, 11 for 2, and 5 for 3 years, making a total of 95 annual records representing 74 households on owner-operated dairy farms throughout the State. The period covered was from 1927 to 1930, inclusive, but a study of changes in general price levels and changing conditions within the State during this period led to the conclusion that the data were sufficiently comparable to be included in one study, inasmuch as there were few apparent changes in the condition of farm families in the State during the period, and the majority of the accounts were kept during the two years 1928 and 1929 in which prices did not change materially.

The average cash and percentage distributions of living expenditures have been tabulated for seven different income levels, the range extending from below $1,200 to $2,700 or above for the money value of all living. The mean gross cash income, based upon 75 records representing 59 farms, was $3,500,

with a range from $549 to $9,341. The farm expenses averaged $2,096 and the expenses for family living $1,055.

As calculated from the total number of 95 records, the farms supplied on the average 40 per cent of the total family living expenses ($372 for food, $133 for wood and ice, and $248 for house rental value). "As the value of all living increased, that of farm products used also increased but not in the same ratio, hence as the value of all living increased the percentage of farm products used decreased. Practically one-half of the value of all living for those families located in the lower income group was farm supplied, and with each rise in the level of living the value of farm-supplied food, of house, and of supplied fuel and ice tended to increase. On the average slightly more than one-half of the food used was farm supplied, percentages varying from 52 to 58 but without relation to the value of all living. Neither was definite relationship apparent between the level of living and the percentages for use of house, or of fuel and ice supplied, although each exhibited some tendency to decrease."

The allocations of living costs are presented in tabular and graphic form and discussed in considerable detail. In comparison with published reports of expense accounts of farm families in other States, it is thought that the expenditures for clothing were relatively low and for education and other items classed as advancement relatively high.

The factors influencing the cost of living are also discussed in considerable detail. In determining the influence of the content of the household upon the cost of living, cost consumption units as developed by Kirkpatrick and associates (see above) were found to be the most satisfactory units for the measurements of household needs for all consumption goods.

MISCELLANEOUS

Index to publications of the United States Department of Agriculture, 1901–1925, M. A. Bradley and M. G. Hunt (*U. S. Dept. Agr., Index Pubs., 1901–1925, pp. VI+2689*).—This is a combined author and subject index of all publications of the Department for the period 1901–1925 with the exception of the periodicals issued by the several bureaus and offices. The *Journal of Agricultural Research* is included.

Work and progress of the [Idaho] Agricultural Experiment Station for the year ending December 31, 1931, E. J. Iddings (*Idaho Sta. Bul. 192 (1932), pp. 49*).—The experimental work not previously reported is for the most part noted elsewhere in this issue.

Forty-fourth Annual Report of [Kentucky Station], 1931, I, T. P. Cooper (*Kentucky Sta. Rpt. 1931, pt. 1, pp. 66*).—The experimental work not previously reported is for the most part noted elsewhere in this issue. Meteorological observations are also included.

Forty-fourth Annual Report of the [Michigan Station, 1931] (*Michigan Sta. Rpt. 1931, pp. 225–296, figs. 17*).—The experimental work not previously reported is for the most part noted elsewhere in this issue.

Forty-fifth Annual Report [of Mississippi Station], 1932, W. R. Perkins et al. (*Mississippi Sta. Rpt. 1932, pp. 64*).—The experimental work not previously reported is for the most part noted elsewhere in this issue.

Forty-fifth Annual Report [of Vermont Station, 1932], J. L. Hills (*Vermont Sta. Bul. 344 (1932), pp. 24*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

[Index to Wyoming Station publications] J. M. Neal (*Wyoming Sta. Index Bul. G (1932), pp. 40*).—This lists all bulletins and annual reports and certain other publications of the station, and indexes Bulletins 122–187, reports 30–41, Circulars 16–25, and State Farm Bulletins 1–7.

NOTES

Arkansas Station.—A new greenhouse which will permit of the enlargement of the plant disease investigations, particularly of Sclerotium rot or southern blight, has recently been completed at the Fruit and Truck Substation.

Two new cooperative projects have recently been begun. One of these is being carried on by the department of horticulture and forestry in cooperation with the department of rural economics and sociology and the Southern Forest Experiment Station, and the other is a joint research project between the Rice Substation, the U. S. Geological Survey, and the State Geological Survey, The purpose of the latter study is to investigate further the ground water supply in the Grand Prairie rice area of Arkansas. A preliminary study in 1928 and 1929 showed that the ground water supply in this region was being consumed in excess of its accumulation, with consequent lowering of the ground water level and increased irrigation costs for rice production.

California University and Station.—*Science* notes that R. W. Hodgson, head of the division of subtropical horticulture, has been appointed assistant director of the branch of the College of Agriculture in southern California.

Maine Station.—A cold storage plant for apples at Highmoor Farm, Monmouth, and a new greenhouse on the university campus at Orono have been built from State appropriations. The cold storage plant was constructed in the basement of the barn and is approximately 74 by 32 by 7.5 ft. The insulation consists of 4 in. of cork board laid in two courses of 2 in. each, and the refrigerating machine has the cooling equivalent of 8.5 tons of melting ice each 24 hours. The complete cost of construction was around $7,500.

The greenhouse consists of a house about 112 ft. long and 32 ft. wide. It is divided into three compartments each 37.5 ft. long and the heating equipment is arranged to provide temperatures in the respective compartments of 50 to 55°, 65 to 70°, and 75 to 80° F. The radiating surface in each compartment is sufficient to maintain the temperatures specified with an outside night temperature of —20°.

Massachusetts College and Station.—Dr. Joseph B. Lindsey, vice director of the station, research professor, and head of the department of plant and animal chemistry, retired December 26, 1932. A graduate of the college in 1883, he had served as assistant chemist in the State station during the ensuing two years, and following his return from Germany in 1892 with the Ph. D. degree of Göttingen University he had been associated continuously with the chemical work of the station. He was also appointed Goessmann professor of chemistry in the college in 1911 and headed its chemistry department thereafter until 1928. His services in these various capacities have been notable, including much pioneer work in animal nutrition and related fields, the publication of over 150 papers, and the training of a large number of other research workers, and his influence upon the institution has been pervasive, permanent, and progressive.

Cornell University.—The New York State Colleges of Agriculture and Home Economics report an increase in registration of students for the fourth consecutive year, the totals reaching 1,522 students. Most of this increase is in

the 4-year courses in agriculture, where the total is 867. In the College of Home Economics 424 students were enrolled, although pending the completion of the new home economics building it has been necessary to restrict drastically the number of entering students.

The steady growth in students in the College of Agriculture is attributed in part to the demand for its graduates, nearly all of last year's graduating class having received positions. A study of the occupations of graduates of the college has shown that about one-fourth engage in farming, one-fourth in teaching, research, or extension, one-fourth in business closely allied with farming, and the remaining fourth in nonagricultural fields.

Wisconsin University.—The new forest products laboratory building, erected on the campus by the U. S. Department of Agriculture at a cost of $800,000, has now been occupied, releasing considerable space for the needs of the various units of the College of Agriculture. The new building is a five-story, U-shaped building, including a sawmill, drying kilns, woodworking plant, gluing and paint shop, mechanical testing laboratory, a creosoting plant, wood-distillation plant, experimental pulp and paper mill, and several chemical laboratories. A special feature of the building is its use of a variety of woods as interior trim.

American Society of Agronomy.—The twenty-fifth annual meeting of this society was held at Washington, D. C., November 17 and 18, 1932. It was preceded by a conference on November 16 on hay standards, marketing, and production, and the soils section held a joint symposium with the American Soil Survey Association at which the subject was soil acidity.

The opening general meeting of the society was devoted mainly to a program celebrating the twenty-fifth anniversary of the society. Papers were presented entitled History of the Organization of the American Society of Agronomy, by T. L. Lyon; A Quarter Century of Development in Soil Science, by J. G. Lipman; and A Quarter Century of Progress in the Development of Plant Science, by C. W. Warburton.

The president's address was given by P. E. Brown and was entitled The Mystery of the Soil. Some of the myriad unsolved soil problems were enumerated, and the need of invoking fundamental research was emphasized.

A feature of the meetings was a radio broadcast by the society embracing the following talks: What the American Society of Agronomy Is Doing and Why, by P. E. Brown; What the American Agronomist Has Contributed to the Science and Practice of Soil Management, by J. G. Lipman; What the American Agronomist Has Contributed to Crop Improvement, by H. K. Hayes; and The American Society of Agronomy and the Farmer, by C. W. Warburton.

Formal organization of the society into soils and crops sections was effected. The crops section arranged its program to include a symposium on the ecology of crop plants and three sessions made up of miscellaneous papers, two of these sessions meeting simultaneously. The soils section also met mainly in two groups, one of which occupied itself with symposia on field plat fertilizer experiments and soil acidity and activity of microorganisms, while the second held two sessions for miscellaneous papers.

The business transacted by the society included the adoption of a new constitution, the reception of the usual reports of officers and committees, and the selection of the following officers: President, M. A. McCall; vice president, R. I. Throckmorton; editor, J. D. Luckett; secretary-treasurer, P. E. Brown; chairman of the crops section, M. T. Jenkins, and of the soils section, R. Bradfield; and representatives on the council of the American Association for the Advancement of Science, C. H. Myers and J. J. Skinner. A. B. Beaumont, A. Boss, M. J. Funchess, S. C. Salmon, and F. T. Shutt were added to the list of fellows of the society.

Meteorological Research.—The Climatological Division and the Division of Agricultural Meteorology of the U. S. D. A. Weather Bureau were consolidated October 1, 1932, to form a new Division of Climate and Crop Weather, to be in charge of J. B. Kincer, formerly head of the Division of Agricultural Meteorology. It is announced that all activities of the old divisions are to be continued under the new organization.

The Smithsonian Institution has established a laboratory in which the growth and behavior of plants may be studied under strict control of light, temperature, humidity, and other factors. The Department of Agriculture will cooperate in a study of conditions best suited to plants of economic importance. The laboratory is in immediate charge of F. S. Brackett, with whom are associated Earl S. Johnston, E. D. McAlister, W. H. Hoover, and others.

A recent number of *Nature* states that "a scientific institute has recently been established in Moscow to carry on research on the circumstances of formation of cloud, fog, and rainfall. The institute has branches in Leningrad, Odessa, Saratov, Tashkent, and Ashkhabad. The Leningrad branch of the institute is installing apparatus for investigating the effect on the atmosphere of high-tension currents, X-ray, ultra-violet rays, and radioactive radiations. It is hoped to test the apparatus next summer in experiments to be carried out in the drought regions of the U. S. S. R."

New Journals.—*Bulletin de l'Institut Agronomique et des Stations de Recherches de Gembloux* is being published quarterly at Gembloux, Belgium. The initial number contains a preface by É. Marchal, director of the State Pathological Station, an account by G. Bouckaert of the history and work of the institute, and the following original articles: Results of Variety Tests with Wheat, by C. Journée and E. Larose (pp. 18–34); the Microbiological Examination of Soils, by G. Verplancke (pp. 35–45); The Question of the Sugar Beet Fly (*Pegomyia hyoscyami betae* Curt.) in Belgium, by R. Mayné and W. van den Bruel (pp. 46–64); and New Apparatus for Determining the Concentration of Hydrogen Ions, by G. Demortier (pp. 65–73).

Current Science is being published monthly at the Indian Institute of Science, Hebbal P. O., Bangalore, India. The primary object of the journal is to provide early publication of short notes of original work and otherwise to further the development of science and industry in India. The initial number contains an article entitled The Study of Nutrition in India, by R. McCarrison.

Helminthological Abstracts, a supplement to the *Journal of Helminthology*, is being published in five parts annually through arrangement with the Imperial Bureau of Agricultural Parasitology at St. Albans, Herts., England. It will constitute a résumé of the current periodical literature on applied helminthology.

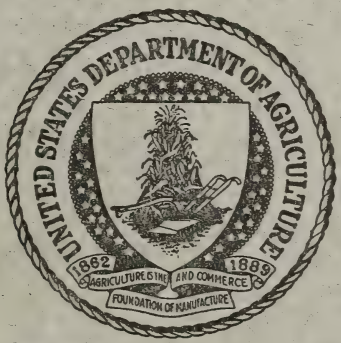
Economía y Técnica Agrícola is being issued monthly by the division of agriculture of the Spanish Ministry of Agriculture, Industry, and Commerce at Madrid, replacing *Boletín Técnico y Económico*. The initial number contains among others a report of Experiments in Hop Growing in Spain, by R. de Escauriaza (pp. 7–11).

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Vol. 68 APRIL, 1933 No. 4

EXPERIMENT STATION RECORD



By direction of the Secretary of Agriculture, the matter contained herein is published as administrative information required for the proper transaction of the public business

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EXPERIMENT STATION RECORD

Editor: HOWARD LAWTON KNIGHT

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EXPERIMENT STATION RECORD

VOL. 68 APRIL, 1933 No. 4

EDITORIAL

WILLIAM ARNON HENRY, WISCONSIN PIONEER

Although more than a quarter century has elapsed since the retirement of Dean and Director W. A. Henry, his death at San Diego, Calif., on November 24, 1932, readily brings to mind his unique and timely service for agricultural education and research. The story of the upbuilding of the agricultural work of the University of Wisconsin under his guidance has often been told, and his success in gaining for the cause the confidence and support of farm people has been widely recognized as far-reaching in its influence. Nor has the passing of the years obscured the significance of what he did, but has rather brought into even clearer perspective his substantial contribution to the agricultural colleges and experiment stations at a critical stage in their history.

Dean Henry himself said truly upon retiring in 1907 that his work had been that of a pioneer. Virtually it began in 1880 with his appointment as professor of botany and agriculture in the University of Wisconsin. He was then 30 years of age, a graduate the preceding spring from Cornell University and with several years of teaching experience in high schools of Indiana and Colorado.

At Wisconsin he soon discovered that although a professor of agriculture had been provided as early as 1868, his department had "no offices and no laboratories; there were no workers in research, no special faculty, and no students." Most discouraging of all, there was little interest in his subject either within the institution or in the State at large.

Opportunity was open for a limited amount of experimental work, however, and in 1883, when provision was made by the State legislature for an experiment station, Prof. Henry became head of this station and continued in this capacity until his retirement. Speaking of this phase of his activities, Dr. E. W. Allen said editorially in these columns in 1907, "he had a thorough appreciation of scientific work and was keenly alive to the needs of the farmer. Step by step he developed different departments of the work, gath-

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ering around him a competent corps of workers, who were inspired by his enthusiasm and aided by his intelligent insight into the practical and scientific bearing of their work. Under his direction the Wisconsin Station has placed to its credit some of the most noteworthy contributions to the science of agriculture, and a multitude of results of practical importance which the institution has carried directly to the farmer."

Despite the efforts of Prof. Henry and his colleagues, interest in collegiate instruction continued to languish through the early eighties. Nevertheless, to quote Dr. Allen again, "he believed in agricultural education and was determined to see its value recognized. If this could not be accomplished under the conventional method of teaching, he was ready to develop and test a new plan, and he had the courage of conviction necessary to carry it out in the face of doubt, if not opposition. And so he organized in 1886 the first successful short course in agriculture in this country; and when its success had been demonstrated he established the first dairy school in America in 1890. Four years later he started the 10-day course for adult farmers, which attracted 175 men the first year and was attended [in 1907] by 607 farmers."

These educational experiments, for such they may be termed, were closely observed and eventually adopted by other institutions, many of which had been facing similar conditions. As Professor Emeritus C. S. Plumb of Ohio State University, virtually a contemporary in the field, has recently said, "all over the country the colleges became interested in the Wisconsin work, and vocational courses and laboratory work in dairying and judging farm animals were the entering wedges of a new agriculture. . . . This vocational phase of agricultural instruction was the salvation of agricultural education in North America."

Aside from the intrinsic value of the short courses, they proved of even greater service by their stimulation of more advanced instruction. Attendance in four-year courses picked up, and even graduate work was soon demanded. Organization of a college of agriculture became possible in Wisconsin in 1891, with Prof. Henry serving as dean until his retirement. At that time its enrollment was in excess of 600 students, and its buildings and equipment had become notable as among the best of their kind.

Although Dr. Henry's institutional service for agriculture is associated exclusively with Wisconsin, he was soon widely known and greatly esteemed beyond its borders. One extensive point of contact was the comprehensive manual entitled Feeds and Feeding, first published by him in 1898, and since familiar to every student of animal nutrition. His portrait constituted the first contribution to a gallery of men conspicuous for their service to the livestock

industry, started in 1902 in Chicago under the auspices of the International Livestock Exposition. Thrice was he recipient of the honorary doctor's degree, from the Universities of Illinois and Vermont in 1904 and the Michigan State Agricultural College in 1907.

Dr. Henry was long an outstanding figure in the Association of American Agricultural Colleges and Experiment Stations, now the Association of Land-Grant Colleges and Universities. He represented the State of Wisconsin in the first convention of this body, held in 1887, was chosen a member of its executive committee the following year, and in 1893 achieved the honor of being the first experiment station director to occupy the presidency. Subsequently he was unfailing in attendance, indefatigable in committee service, and the sponsor of an unusual number of worthy projects.

In 1888 he argued for close contacts by the colleges and stations with farmers, opened a discussion of how the Federal Department of Agriculture could assist the stations by drawing special attention to the opportunity for centralized bibliographical work and the compilation of material from a broad national viewpoint, and pleaded for inclusion in the association's membership of the staff members as well as the administrative heads. He early advocated the abstracting by the Office of Experiment Stations of European investigations as well as those in this country, and took a prominent part in arranging active station participation in the World's Columbian Exposition at Chicago and later expositions elsewhere. In 1901 he secured the passage of a resolution favoring more adequate accommodations for the Department of Agriculture, and for several years he served on a committee to promote cooperative relations with the Department. He introduced a resolution in 1900 and again in 1901 to the effect that directors and department heads of experiment stations should, if possible, devote their whole time to the work of investigation, and while this resolution was subsequently withdrawn, the discussion was doubtless beneficial. He obtained a reorganization of the association itself whereby a section of experiment station work was set up in 1903. Many other items in the record attest the breadth of his interest and his prestige among his colleagues.

Special mention should be made of his presidential address, delivered on October 17, 1893. In this he reviewed the passage of the Hatch Act and the developments under its provisions during the intervening six years, and stated that "the more I study the work of our experiment stations, the more I am pleased with what we have accomplished and the larger grows my faith in the high position they are destined to occupy in American agriculture." Nevertheless, he stated rather bluntly that in his opinion serious mistakes had been made. Among the outstanding needs he cited the more

careful planning of work, greater continuity, concentration upon no more projects than could be adequately maintained, greater cooperation between stations, and especially a clearer demarcation and differentiation between teaching and research.

Dr. Henry's interest in improving the quality of the station research continued to develop with the years, and in 1906 many of his ideals found fruition in the passage of the Adams Act. Beginning with a conference with Mr. Adams in 1903, he had a large share in the initiation and drafting of this legislation. It was largely because of the stress which he and others laid on the need for the more fundamental investigations that the funds provided by the act were restricted "to paying the necessary expense of conducting original researches or experiments bearing directly on the agricultural industry of the United States."

The final address of Dr. Henry before the association was given November 15, 1906. Entitled The Agricultural College and the State: A Plea for a New Division of College and Station Workers, this address logically supplemented his previous pleas for a station staff freed as largely as possible from the distractions and burdens of other duties. "As a remedy for the present unsatisfactory situation," he said, "I suggest that there be organized in every college and station a separate corps of workers whose sole duty shall be to serve as intermediaries between the college and station on the one hand and our great farm clientage on the other. They will relieve the investigators and teachers of a large portion of their present extra college and station duties. High-grade research and the best quality of classroom instruction will then, and only then, be possible. With this corps of specially trained middlemen our colleges and stations will serve the farmers far better than is now possible." By this advocacy of an extension force nearly a decade before the Smith-Lever Act, Dr. Henry showed himself to the end consistently the pioneer.

The 27 years during which Dr. Henry did his principal work for agricultural education and research covered a period of much responsibility for the leaders in this field. There was serious danger on the one hand that the colleges and stations would fail to gain and hold the confidence of farm people, and that on the other the achievement of popularity would impair the depth and soundness of their work by a dissipation of energies in meeting immediate demands. Dr. Henry saw both these dangers and how to combat them. That these institutions find themselves to-day so firmly intrenched in public esteem seems due in no small degree to his practical common sense, his initiative and resourcefulness, and, above all, to his appreciation of and insistence upon high ideals.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

The sulfur distribution in proteins, H. D. Baernstein (*Jour. Biol. Chem., 97 (1932), No. 3, pp. 669–674*).—Total sulfur was determined by peroxide fusion in a Parr bomb, the sulfhydryl and disulfide sulfur by the author's gasometric method (E. S. R., 65, p. 206), and methionine by the method described in the abstract noted on page 438.

In the gasometric sulfhydryl and disulfide method, "zinc has been substituted for Devarda's alloy, since this preparation contains copper and during the reduction of disulfide becomes reduced and subsequently uses up some of the iodine which is added to the mixture. The time allowed for action of zinc has been lengthened to make sure of complete reduction of disulfide to sulfhydryl, and this necessitated the introduction of more sodium hydroxide in the hydrazine solution which is used in the Van Slyke manometric chamber to titrate the iodine. The hydrazine solution now contains 1 volume of a saturated solution of hydrazine sulfate and 3 volumes of saturated sodium hydroxide. With this mixture the zinc hydroxide, which first precipitates when the sample is introduced, is completely dissolved with very little difficulty.

"The proportions of digest to iodine have been modified to increase the accuracy of the method. The mixture used in the present work contained 6 c c of protein digest, 2 c c of concentrated HCl, and 2 c c of iodine in KI. This change . . . makes necessary a change in the factor used to convert gas pressure to milligrams of cystine. It was thought advisable to determine this factor each day with a standard cystine solution rather than to rely on a precalculated factor as recommended before."

The sulfur distribution of 32 purified proteins is given, showing 101.5±6.6 per cent recovery of the sulfur. The range of sulfhydryl + disulfide sulfur was that of from 17.7 to 84.3 per cent of the total sulfur; of the methionine sulfur, one of from 26 to 90 per cent.

Preparation and properties of the normal barium salt of *l*-cystine, C. J. B. Thor and R. A. Gortner (*Jour. Amer. Chem. Soc., 54 (1932), No. 7, pp. 3009–3011*).—A note contributed from the University of Minnesota reports as a very satisfactory method for the preparation of a salt hitherto not described, the mixing of equivalent quantities of aqueous barium hydroxide solution and cystine, with a subsequent precipitation of the resulting salt by the addition of several volumes of alcohol. The yield was 96.5 per cent of that calculated from the weight of cystine used. The precipitate was a white, finely divided substance, showing "no clearly defined crystalline form" under the microscope, and soluble in water at 25° C. to the extent of 6.15 per cent. The barium salt had the specific rotation, —61.9°. On treatment with hydrochloric acid it yielded free cystine, of which the specific rotation was —199.1° as against —204.2° for the original cystine. The last-named result "indicates that racemization had not occurred to any considerable extent during the formation of the barium salt. Hence, it is safe to conclude that Preparation II consisted almost entirely of the barium salt of *l*-cystine."

The oxidation of cystine in acid solution, J. C. ANDREWS (*Jour. Biol. Chem., 97 (1932), No. 3, pp. 657–662*).—The rate of racemization of *l*-cystine in hydrochloric acid and sulfuric acid solutions and the velocity constants for the reaction were determined for solutions in 0.5, 2.5, and 6 N HCl and in 2.5 N H_2SO_4 at both room temperature and 38°.

In addition to the racemization, the cystine was found to undergo oxidation by atmospheric oxygen to cysteic acid, but this oxidation occurred only in the hydrochloric acid solutions. There was no evidence of oxidation in the sulfuric acid solutions. There was no evidence of any formation of hydrogen sulfide or of any other compound reacting positively with the nitroprusside reagent. There was no evidence of ammonia evolution. The Van Slyke determination gave (in a 3-minute reaction) a yield of amino nitrogen corresponding quantitatively to all of the cystine originally present. Small amounts of the cystine were so far oxidized as to yield sulfuric acid, but the principal oxidation product was the cysteic acid, partially racemized, which was isolated to the extent of about 78 per cent of the original cystine present and identified by analysis, optical activity, titration, and "melting point." The reaction appeared to be one of atmospheric oxidation.

Decomposition of lecithin in eggs, L. C. MITCHELL (*Jour. Assoc. Off. Agr. Chem., 15 (1932), No. 2, pp. 282–284*).—A decomposition unusual in type, in that the lipoid phosphorus was attacked, and of unusual rapidity was observed by the author of this contribution from the Chicago station of the U. S. D. A. Food and Drug Administration, the opinion being expressed in the present report that "the actual decomposition of the lecithin is probably due to the enzyme lecithinase (or lecithnase) produced during the growth of bacteria."

The isolation of hexuronic acid, E. K. NELSON (*Science, 76 (1932), No. 1972, p. 345*).—Various difficulties encountered by the author in attempts to isolate hexuronic acid from oranges by the methods of King and coworkers (E. S. R., 67, p. 650) are noted briefly. Better results were obtained with this method than with the Szent-Györgyi method (E. S. R., 67, p. 645), which was found to be "extremely complicated and fraught with difficulties."

A study of the antimony trichloride color reaction for vitamin A.—V, Evaluation of a colorimetric unit on the basis of the biological unit for vitamin A, E. R. NORRIS and A. E. CHURCH (*Jour. Nutrition, 5 (1932), No. 5, pp. 495–501, figs. 2*).—In this continuation of the series of papers noted previously (E. S. R., 64, p. 803), a comparison is reported for two cod-liver oils of the results obtained in the biological and colorimetric methods of determining the vitamin A content. The method followed in the biological tests was essentially that of the U. S. Pharmacopoeia, tenth edition, with certain modifications.

In discussing the method, special attention is given to the debated question of the most suitable end point for the depletion period. In the opinion of the authors "the proper time first to administer the supplementary source of vitamin A can not be adequately determined by a fixed rule, but must be interpreted in the light of the worker's experience in observing the onset of deficiency symptoms in a large number of rats, and checking by running controls to be certain of depleting the stored vitamin." In the studies reported the depletion period of 105 rats varied from 26 to 33 days, with an average of 31 days. The period of stationary and declining weight varied from 5 to 8 days, depending upon the gross symptoms of vitamin A deficiency.

Another point discussed was the length of the experimental period. The average deviations of growth response from the arithmetical mean for successive weeks from the first to the eighth were 3.2, 2.5, 1.6, 1.3, 1.4, 1.1, 1.1, and 1,

thus showing greater uniformity as the length of the experimental period increased.

The colorimetric values were determined as described in previous papers of the series, only those values being used which were linear functions of the amount of oil taken for the test. The Lovibond units estimated from the tangents to the dilution curves equivalent to 10 biological units (Sherman) were 4.5 and 4 for the two oils when the duration of the feeding experiment was 4 weeks, 5.5 and 5.7 for 5 weeks, and 7.1 and 8.2 for 8 weeks.

The general chemistry of the enzymes, J. B. S. Haldane and K. G. Stern (*Allgemeine Chemie der Enzyme. Leipzig: Theodor Steinkopff, 1932, pp. XII+367, figs. 38*).—This German revision of the English monograph of Haldane (E. S. R., 64, p. 203) differs from Haldane's original work especially in that (1) the original author has made a number of changes and additions, and (2) the German author has added new experimental results and theoretical matter, particularly in the chapter dealing with specificity; co-enzymes, activators, kinases, and complements; the poisoning of enzymes; the purification and the chemical nature of the enzymes; and theories of enzyme action and the classification of enzymes. The bibliography is said to exceed that of the English edition of the work by some 400 citations.

Relationships between the activation of pancreatic lipase and the surface effects of the compounds involved: The mechanism of inhibition and activation, D. Glick and C. G. King (*Jour. Biol. Chem., 97 (1932), No. 3, pp. 675–684, figs. 3*).—The inhibiting effects of bile salts and of resorcinol upon liver esterase were measured, and a method for the measurement of the activation of pancreatic lipase by organic compounds, in which the enzyme and the surrounding solution are the only two phases present, is described. The activating effects of a number of compounds upon pancreatic lipase were measured and are compared with the inhibiting effects of the same substances upon liver esterase. In general the compounds which exhibited the most inhibition of esterase also activated lipase to the greatest degree. The surface tensions of a number of solutions of the compounds studied were determined at different concentrations, and the results are used in elaborating a theory of the possible mechanism of the inhibiting and activating effects observed.

Oxidation-reduction potentials in relation to the growth of an aerobic form of bacteria, W. P. Allyn and I. L. Baldwin (*Jour. Bact., 23 (1932), No. 5, pp. 369–398, figs. 5*).—An antipolarization vacuum-tube potentiometer circuit for electrometric measurements of oxidation-reduction potentials of biological systems is described in a contribution from the Wisconsin Experiment Station, together with work indicating that the oxidation-reduction potentials of the medium exert a decisive influence on the ability of certain aerobic bacteria to initiate growth. A yeast-water mannitol and a mannitol-nitrate medium were studied. The first medium was found to be the more strongly reducing and to support growth at high dilutions of the organisms. The mannitol-nitrate medium permitted growth in similar dilutions only after the potential was sufficiently reduced. It was found possible to poise the yeast-water mannitol medium with hydrogen peroxide at potentials sufficiently high to inhibit growth completely, and yet to recover the organisms after 80 hours by reducing the potentials of the systems.

Agar appeared not only to afford physical advantages to the organisms in initiating growth due to its colloidal nature, but also to act as a mild reducing agent under the conditions of these experiments. Large inocula showed greater ability than small to overcome unfavorable oxidation-reduction conditions, in media either too highly oxidized or too highly reduced for optimum growth. The oxidation-reduction potentials limiting bacterial growth ap-

peared partially dependent also on other characteristics of the medium. "A more suitable ion-balance or a more available nitrogen source, for example, appears to facilitate wider adjustments of unfavorable potentials by the bacteria themselves."

Potential-time courses developed by rhizobia were measured, and the factors responsible for the negative drift of potentials in the bacterial cultures are discussed. "The behavior of the rhizobia toward atmospheric oxygen is determined largely by the oxidation-reduction character of the medium, as indicated by the growth levels established by the organisms in media possessing different oxidation-reduction properties. Pellicle formation in liquid media seems to be definitely correlated with the oxidation-reduction potentials of the system in the case of rhizobia. The bacteria collect at the surface in a pellicle as the potential of the medium falls, due to their metabolic activities."

The decomposition of proteins by microorganisms, with particular reference to purified vegetable proteins, S. A. WAKSMAN and R. L. STARKEY (*Jour. Bact., 23 (1932), No. 5, pp. 405–428, figs. 2*).—Purified plant proteins, when added to a liquid medium containing the necessary mineral salts, were found by the authors of this contribution from the New Jersey Experiment Stations to be readily decomposed by microorganisms, including bacteria, actinomyces, and fungi.

"There is as much difference between the rates and extent of decomposition of different proteins of animal origin as between the rates and nature of the decomposition of animal and plant proteins. When the proteins are used as the only sources of carbon for the microorganisms, the reaction of the medium changes rapidly to alkaline and a large part of the nitrogen is lost through volatilization in the form of ammonia. . . . The ratio of protein decomposed to protein snythesized by microorganisms was widest in the case of the bacteria and narrowest for the fungi; the actinomyces were intermediate. It is suggested that the resistance to microbial decomposition which proteins exhibit when contained in certain plant tissues is due not so much to differences from animal proteins in chemical structure as to the formation of resistant complexes with nonnitrogenous compounds."

Equations permitting calculations of the amount of protein decomposed and the amount of cell substance snythesized are presented.

Factors influencing the reduction of nitrates and nitrites by bacteria in semisolid media, C. E. ZOBELL (*Jour. Bact., 24 (1932), No. 4, pp. 273–281*).—The author of this contribution from the University of California found about 600 strains of bacteria constant in their ability to reduce nitrates; but "many species of microorganisms destroy nitrites as they are formed from nitrates, so that nitrite tests are frequently negative although nitrates have been reduced. This property which obtains in the Brucella and in the Salmonella groups is in part responsible for the contradictory reports concerning their nitrate reducing ability. It is recommended that a test for the presence of nitrates invariably be made in conjunction with the test for nitrites when the latter is negative."

Magneto-optic method of analysis as a new research tool, F. ALLISON (*Indus. and Engin. Chem., Analyt. Ed., 4 (1932), No. 1, pp. 9–12, figs. 3*).—Possibilities of the use of magneto-optical methods are shown to include the qualitative analysis of extremely small amounts of materials; quantitative analysis, with an accuracy under best conditions of from two to three significant figures, a sensitivity of the order of 1 part in 10^{11}, noninterference of other substances present, and the fact that the sample is unaffected by the analysis; and the detection of intermediate compounds in certain reactions.

"While the method has been applied chiefly to analyses of solutions of inorganic compounds, a limited amount of investigation has shown that it has approximately the same sensitivity for organic compounds."

A spectrophotometric development for biological and photochemical investigations, F. S. Brackett and E. D. McAlister (*Smithsn. Misc. Collect., 87 (1932), No. 12, pp. 7, pls. 3, figs. 5*).—"Investigations of the effect of radiation upon biological material can be carried out advantageously with microscopic organisms such as unicellular algae, bacteria, yeast, and fungi, along lines closely analogous to customary spectroscopic practice. The great advantage of this general method of approach is that one is able to obtain numerical evaluations which depend statistically on large numbers of organisms without going to equipment of cumbersome dimensions. The needs are, however, sufficiently different as to make desirable the development of special equipment and methods." Such equipment and the methods of applying it form the subject of the present paper.

"Where slides can be prepared coated with a layer of microscopic organisms, they may be exposed in an instrument of the spectrograph type. Since, however, there exist essential difficulties in securing either as great uniformity or as fine texture or structure as is presented by the photographic plate, it is desirable to secure as large an area exposed to a given wave length as possible. In other words, one wishes to work with a wide and long slit and as large monochromatic images of the slit as is compatible with essential spectral purity. A second demand is that provision be made for a nonselective determination of the relative intensities of the different wave lengths incident upon the organisms. A third demand is that provision be made for the exposure of the organisms without great hazard of contamination. These three requirements determine the general character of the combined recording monochromator and biological spectrograph which has been constructed."

Microanalysis of gases in relation to organic and physiological chemistry, D. Burk and R. T. Milner (*Indus. and Engin. Chem., Analyt. Ed., 4 (1932), No. 1, pp. 3–7, figs. 9*).—"This paper presents a brief review of the present general methods and chief problems of microanalysis of gases with particular reference to organic microanalysis, and describes some specific illustrative applications to organic and physiological chemistry of an apparatus which now exists in a highly perfected form and is being used at the [U. S. D. A.] Fixed Nitrogen Research Laboratory to study biochemical nitrogen fixation."

Microanalytical methods as time and labor savers, E. M. Chamot (*Indus. and Engin. Chem., Analyt. Ed., 4 (1932), No. 1, pp. 7, 8*).—Microchemical and microscopical (E. S. R., 65, p. 309) methods of analysis "possess such potential economic possibilities that all analysts should become familiar with them, not only because they provide means for the solution of many problems which can not be solved by other methods, but also because they provide the most practicable way of reducing costs and of saving time in analytical and research laboratories."

The ultracentrifuge and its field of research, J. B. Nichols (*Indus. and Engin. Chem., Analyt. Ed., 4 (1932), No. 1, pp. 12–17, figs. 14*).—Two types of centrifuge are described, the one yielding moderate forces up to 10,000 times that of gravity, the other capable of producing an action 100,000 times that of gravity. The uses, as thus far developed, of the ultracentrifuge are briefly discussed. Such uses include the possibility of deciding whether a substance is mono- or polydisperse and, if polydisperse, the range of particle sizes or number of molecular species present; "the uncovering of structural relationships as evidenced by the classification of many proteins into groups which are integral multiples of a molecular weight of 34,500"; the separation and optical

analysis of mixtures of micelles; the study of the effect of pH on the molecular condition or aggregation of a substance; the determination of the molecular weights of complex dyes, which opens the way to a study of indicator action and the effect of salts on association; and the study of the formation of primary colloidal particles and the factors influencing the subsequent growth.

Note on micro-Dumas method for determination of nitrogen, R. T. K. CORNWELL (*Indus. and Engin. Chem., Analyt. Ed., 4 (1932), No. 1, p. 42*).—Manipulative details, by adherence to which the author and others were enabled to avoid the measurement of analytically appreciable quantities of carbon monoxide with the nitrogen, are described in a contribution from the U. S. Public Health Service.

The determination of the acids of plant tissue.—I, The determination of nitric acid, G. W. PUCHER, H. B. VICKERY, and A. J. WAKEMAN (*Jour. Biol. Chem., 97 (1932), No. 3, pp. 605–615*).—The method described (a contribution from the Connecticut State Experiment Station) depends upon the observation that nitric acid is quantitatively extracted by ether from tissue that has previously been treated with sulfuric acid sufficient to bring it to a reaction approximately of pH 1. The acidic substances in the ether extract were transferred to aqueous alkali, and the nitrate in this solution was determined either by reduction to ammonia, by boiling with acid and iron powder followed by distillation and estimation by Nessler's method, or the nitrate was determined gravimetrically as nitron nitrate.

The authors point out that other methods could equally well be applied for the determination of the ether extract nitrate. "The ether extract from the tissue contains a small proportion (20 to 30 per cent) of its nitrogen in forms other than nitrate. In particular it contains a measurable proportion of ammonia and also of substances that yield ammonia on mild acid hydrolysis. Although the presence of these renders it necessary to conduct blank experiments when the nitrate is determined by reduction with acid and iron, the magnitude of the blank is small and, in cases in which the nitrate content of the tissue is high, the blank determination may be neglected without serious error."

The determination of methionine in proteins, H. D. BAERNSTEIN (*Jour. Biol. Chem., 97 (1932), No. 3, pp. 663–668, fig. 1*).—Essentially, the methionine determination proposed by the author of this contribution from the University of Wisconsin consisted in boiling 0.5 g of the protein under examination with 10 c c of pure aqueous hydriodic acid in a special apparatus permitting carbon dioxide to be bubbled through the reaction mixture and providing for the passage of the gases evolved through a reflux condenser, a trap solution of acidified cadmium sulfate containing red phosphorus in suspension to remove hydrogen sulfide, iodine, and hydriodic acid into an absorbing solution of silver nitrate in absolute alcohol. It was found that a volumetric determination of the silver remaining in solution provided a means of determining the methyl iodide formed and absorbed by the silver nitrate solution simpler and better than the direct determination of the silver iodide. Trials with pure synthetic methionine gave figures averaging 97.6±1.4 per cent of the theoretical.

Eleven amino acids were subjected to the treatment described. All of these gave negative results. Also, when the figures for methionine thus obtained were calculated as sulfur, this fraction exactly supplemented the fractions of sulfur present in the proteins as sulfhydryl and disulfide. In an application of the method to three samples of casein and two of fibrin and zein prepared in different laboratories, the results showed excellent agreement.

The α-globulins of the bean proteins showed about twice as much methionine as the β-globulins, and the animal proteins were found higher in methionine than the vegetable proteins.

The determination of sodium [trans. title], G. B. VAN KAMPEN and L. WESTENBERG (*Dept. Binnenland. Zaken en Landb.* [*Netherlands*], *Verslag. Landbouwk. Onderzoek., No. 38 E (1932), pp. 21–29; Eng. abs., p. 29*).—The following procedure was found superior in rapidity and in accuracy to methods of earlier types:

Incinerate 5 g of the finely divided material at as low a temperature as possible in a platinum dish or in a porcelain crucible. After insolubilization of the SiO_2 by repeated evaporation to dryness with concentrated hydrochloric acid, wash the residue with water and filter into a volumetric flask of 100 c c capacity. Boil the filtrate for about 10 minutes with enough powdered pure CaO to render the liquid alkaline. After cooling, making to volume, and filtering, evaporate 15 c c of the filtrate to dryness in a porcelain dish after adding about 3 c c of perchloric acid. Wash the $KClO_4$ formed, first with alcohol containing 1 per cent of $HClO_4$, afterwards with a small quantity of 96 per cent alcohol, and filter. After diluting the filtrate with water and after adding a small quantity of MgO, evaporate to dryness. Moisten the residue with a few cubic centimeters of water, filter it off, and wash it into a beaker. Evaporate until only about 2 c c remain. Precipitate the sodium by adding 15 c c of the uranyl reagent, according to Kahane (E. S. R., 63, p. 804). After letting the precipitate stand for a night, filter off in a Gooch crucible containing a disk of filter paper, wash with alcohol of 96 per cent, dry half an hour at 105° C., and weigh.

The determination of sodium by precipitation as the triple salt sodium-uranyl-magnesium acetate, C. S. PIPER (*Jour. Agr. Sci.* [*England*], *22 (1932), No. 3, pp. 676–687*).—The author compares the methods of Kahane (E. S. R., 63, p. 804) and of Bray (E. S. R., 60, p. 615) for the determination of sodium by means of the reagent proposed by Kolthoff (E. S. R., 58, p. 608) with special reference to their suitability for the determination of exchangeable sodium in soils. "Bray's modification. . . ., involving 48 hours' standing, was found to give a poor separation from even small amounts of potassium salts, leading to high results for sodium. Kahane's method was more convenient and gave very satisfactory results, precipitation being complete in 30 minutes." Moderate quantities of calcium, barium, and ammonium chlorides and potassium up to 0.034 g of potassium chloride per determination did not interfere. Sulfates interfered only if both the calcium and the sulfate ions were present and the solubility of calcium sulfate was exceeded. Pure solutions of sodium chloride gave recoveries of from 101.5 to 99.3 per cent. "Good recovery of sodium chloride added to ammonium chloride extracts of soils was also obtained, the average error being 1 per cent."

Citrate-insoluble phosphoric acid in di- and tricalcium phosphates, K. D. JACOB, L. F. RADER, JR., H. L. MARSHALL, and K. C. BEESON (*Indus. and Engin. Chem., Analyt. Ed., 4 (1932), No. 1, pp. 25–31, fig. 1*).—Investigations with the pure di- and tricalcium phosphates, recorded in a contribution from the U. S. D. A. Bureau of Chemistry and Soils, showed that the solubilities of these compounds in ammonium citrate solution were affected to a considerable extent by the weight of sample taken for analysis, the presence of other salts, the pH of the citrate solution, and the temperature at which the salt was heated before the citrate digestion. The solubilities were affected to a less extent by the fineness of the particles, the gravity of the citrate solution, and the time of the citrate digestion.

Colorimetric determination of traces of manganese and chlorine with benzidine, R. C. Stratton, J. B. Ficklen, and W. A. Hough (*Indus. and Engin. Chem., Analyt. Ed., 4 (1932), No. 1, p. 2*).—Benzidine hydrochloride added to a very dilute solution containing the permanganate ion or free chlorine, or both, produced a brilliant blue-green color. The procedure was found applicable wherever manganese is to be determined as permanganate ion in the absence of free chlorine, or free chlorine in the absence of the permanganate ion. The blue-green color produced by benzidine hydrochloride was much more brilliant and consequently more favorable for colorimetric estimation than the natural color of the permanganate ion or its combination with orthotolidine in very dilute solutions. The most favorable range in which to judge the color produced by the permanganate ion was found to be that in which the amount varies from 0.0001 to 0.001 mg in 100 c c of the solution, while the most favorable range in which to judge the color produced by free chlorine was that in which the amount varies from 0.001 to 0.01 mg in 100 c c of the solution.

"The great disadvantage of this method is the fading of the color produced. In about 2 minutes the blue-green color changes to a yellow-green, which also is not persistent, and therefore the estimation has to be made immediately. This makes the preparation of an artificial color standard necessary. Such a standard can be prepared by mixing solutions of copper sulfate and picric acid. The presence of large amounts of sulfate should be avoided, since the sulfate ion reacts with benzidine base to produce a white crystalline precipitate which interferes with the accurate judging of the color."

Determination of boron in waters, F. J. Foote (*Indus. and Engin. Chem., Analyt. Ed., 4 (1932), No. 1, pp. 39–42, figs. 3*).—"The principle of the determination is that with no mannitol present boric acid is so weak that it is only partially neutralized at a pH of 7.6, but in the presence of sufficient mannitol it is completely neutralized at this pH. No other acids or bases encountered or tested are affected by mannitol, so that the boric acid can be accurately titrated by bringing the solution to a pH of 7.6, adding mannitol, and titrating back to the same pH. The alkali used for titrating is standardized against a known amount of boric acid in the same manner, so that the small amount neutralized up to pH 7.6 is taken care of in the standardization factor."

Aluminum in ash of plant materials, fruit juices, and similar products, L. Hart (*Jour. Assoc. Off. Agr. Chem., 15 (1932), No. 2, pp. 285–289*).—Essentially, the method described consisted in ashing carbon free a sample containing from 2 to 10 mg of aluminum, dissolving the ash in diluted hydrochloric acid with the addition of a few drops of nitric acid to oxidize any iron present, fusing the residue with alkali carbonates, treating the fusion like the original ash, and twice precipitating the iron and aluminum as phosphates at pH 4 (with ammonia and ammonium acetate, bromocresol green as indicator), following which the iron was separated by precipitation as the cupferron salt and the aluminum precipitated and weighed as the 8–hydroxyquinoline salt.

Test solutions containing known quantities of aluminum and samples of cider vinegar gave satisfactory results. Full working detail of the method is given.

Determination of carbon in organic compounds, A. Chalmers (*Indus. and Engin. Chem., Analyt. Ed., 4 (1932), No. 1, pp. 1, 2, fig. 1*).—Essentially, a sample of 0.1 g or somewhat less is oxidized with 2 g of chromium trioxide in the presence of 10 c c of concentrated sulfuric acid under conditions such as to permit the manometric determination of the quantity of carbon dioxide produced. The apparatus consists of an Erlenmeyer flask into the neck of which is ground a wide tube (about ¾ in. inside diameter) about 6 in. in height

from the ground-joint to the closed top. The inclosure consists of a short taper with a short glass hook sealed inside to permit hanging the thermometer in the apparatus with the thermometer bulb about 1 in. from the bottom of the flask. A manometer tube is sealed into the wide head tube about 2 in above the ground joint. Millimeter graph paper pasted onto a piece of stiff cardboard was found to make an efficient manometer scale.

The sample and the chromic anhydride are placed in the flask, and the acid is so added that mixture does not take place until after the apparatus has been closed, the temperature noted, and the manometer reading recorded. Mix the contents of the flask, and, after reaction has apparently taken place, heat carefully (steam bath), and continue heating slowly until effervescence ceases, when the temperature should be about 80° C. "Prolonged heating above this temperature leads to evolution of oxygen." Cool to the initial temperature, read the manometer, and calculate, correcting for the carbon dioxide dissolved in the acid by adding to the carbon directly calculated the quantity $\frac{\%\text{ carbon found}}{25} \times 0.4$. Trial determinations reported give the results: Succinic acid, found 41.04 per cent carbon, calculated 40.6 per cent; benzoic acid, found 68.3 and 68.5, calculated 68.8; cellulose, found 44.4 and 44.3, calculated 44.4 per cent.

Interference of reducing sugars in ninhydrin reaction for amino acids and related compounds as applied to carbohydrates, J. A. Ambler and J. B. Snider (*Indus. and Engin. Chem., Analyt. Ed., 4 (1932), No. 1, p. 37*).—In experiments recorded in a contribution from the U. S. D. A. Bureau of Chemistry and Soils, it was evident that reducing sugars are objectionable in the ninhydrin test when more than 10 mg of glucose or 1 mg of fructose are present. The greater activity of fructose was further shown by the fact that all the tubes containing this sugar, with the exception of the one containing 1 mg, developed a red color during the first 5 minutes of heating, whereas the tubes containing glucose, after being heated for 10 minutes, showed merely a gradation of purple corresponding to the quantity of glucose present, and the one with 10 mg was still purple when removed from the bath at the end of half an hour.

With 400 mg of fructose and 0.2 mg of amino nitrogen, in less than 2 minutes after the tube was placed in the bath the reaction mixture had developed a deep blue color. In about 15 minutes slight effervescence was noted, and the blue color gradually disappeared. In 25 minutes the color was a deep red. When the solution was diluted to 100 c c, the color was "a very dark brown with a slight purplish nuance," and the solution contained flocculated material. "This experiment clearly indicated that fructose destroys the blue ninhydrin-amino acid compound when the latter has been formed, in addition to possible destruction of ninhydrin itself."

An ether extract method for paste-like samples, G. Pitman (*Jour. Assoc. Off. Agr. Chem., 15 (1932), No. 2, pp. 299–304, fig. 1*).—The author of this contribution from the fruit products laboratory, University of California, proposes essentially to spread the paste to be examined upon strips of filter paper, rolling the whole into a closed package to be placed in the extraction apparatus. He finds petroleum spirit more suitable than ether for use as solvent. The method was found advantageous in that it eliminates one weighing, permits a larger (10 g) sample to be used, makes the handling of the sample less troublesome, and exposes a larger surface to the extraction liquid, rendering the extraction more complete and a reextraction after grinding with sand unnecessary. Materials and manipulation are described in working detail.

Estimation of starch in feeding stuffs, G. S. Fraps (*Jour. Assoc. Off. Agr. Chem., 15 (1932), No. 2, pp. 304–307*).—The paper contains a modification of the Official method for the determination of starch by acid hydrolysis and of the two Official methods for starch in feeding stuffs, and makes a comparison summarized as follows:

"The use of takadiastase in the estimation of starch in feeding stuffs is better than the use of malt, as the correction for the sugars dissolved is smaller. The Official acid method of hydrolysis includes large amounts of pentosans. The use of weaker acid (0.02 N) reduces the quantity of pentosans dissolved and thereby increases the accuracy of the method. Correction can be made for the pentosans by analysis or by the use of an arbitrary correction. When the results are corrected, the hydrolysis with 0.02 N acid gives approximately the same results for starch as that with the malt diastase or the takadiastase."

Estimation of iron in feeding stuffs, G. S. Fraps and J. F. Fudge (*Jour. Assoc. Off. Agr. Chem., 15 (1932), No. 2, pp. 307–310*).—The thiocyanate colorimetric method of Elvehjem and Hart (E. S. R., 55, p. 614) and that of Reis and Chakmakjian (E. S. R., 67, p. 105) (ferrocyanide colorimetric, with the use of gum ghatti to hold the ferric ferrocyanide in suspension) were compared as adapted for use in the analysis of feeding stuffs with the provisional A. O. A. C. method. Of the data obtained it is noted in part that "the results of the ferrocyanide method and the A. O. A. C. method agree well on the materials analyzed except on meat and bone scraps, on which the A. O. A. C. method gives decidedly higher results which are probably correct. If the results on meat and bone scraps are excluded, the average by the ferrocyanide method and by the A. O. A. C. method are practically the same, while the average by the Elvehjem method is decidedly lower. The error in colorimetric methods, like those due to difficulty of the eyes in distinguishing slight changes in color, is at least 5 per cent of the total. The A. O. A. C. method seems to be preferable to the other two, though the ferrocyanide method is nearly as good."

An electrolytic method for the determination of copper and lead in Bordeaux-lead arsenate mixtures, C. G. Donovan (*Jour. Assoc. Off. Agr. Chem., 15 (1932), No. 2, pp. 289–292*).—The author of this contribution from the U. S. D. A. Food and Drug Administration proposes the complete volatilization of the arsenic by evaporation with hydrochloric and hydrobromic acids, followed by several evaporations with dilute nitric acid to decompose the bromides and chlorides formed; and a final simultaneous electrolytic determination of the copper as the metal and of the lead as peroxide deposited on the anode. The deposit of lead peroxide having been found not to be completely anhydrous, factors for the conversion of lead peroxide deposits to anhydrous lead oxide when dried in an oven at 105–110° C. for one hour are given.

The relation between temperature and the rate of fermentation of commercial sauerkraut, C. S. Pederson (*New York State Sta. Bul. 614 (1932), pp. 23, figs. 6*).—"The time required for complete fermentation of sauerkraut in 125 vats during three seasons in one factory, when compared with the atmospheric temperature at the time of filling, shows that the lower the temperature at the time of filling the vats the slower is the rate of fermentation. The rate of fermentation of vats of kraut in other factories shows that there are a number of temperature factors, especially the temperature of the building, which affect the temperature of the shredded cabbage. Because of these other factors, the time which will be required for a vat of sauerkraut to ferment can not be accurately predicted."

The quality of commercial sauerkraut, C. S. Pederson and C. D. Kelly (*New York State Sta. Bul. 613 (1932), pp. 14*).—Samples of sauerkraut from packers throughout the United States were examined for quality in relation to chemical and physical characteristics. From the analyses it was concluded that an abnormal salt content results in an abnormal texture and otherwise influences quality. A definite relationship of quality to the chemical analysis was noted. More care with regard to control of surface fermentation and in the packing of the product, as well as in the use of quantitative methods for testing salt content and acidity, "would be beneficial in improving the quality of commercial sauerkraut."

The commercial processing of apple juice, D. C. Carpenter and W. F. Walsh (*New York State Sta. Tech. Bul. 202 (1932), pp. 28, fig. 4*).—The chemical composition of the suspended material found in freshly pressed apple juice was found not to be constant for the different varieties examined.

A method for the coagulation of the suspended colloidal material by heating to 180° F. for 20 seconds and cooling immediately is proposed. Apple juice heated in this manner could be filtered by the use of a filter aid to give a very clear and palatable beverage. Further filtration through the Seitz germ-proofing filter resulted in a clear sterile juice that could be filled into sterile containers for the market, or carbonated to give an effervescent beverage. This method is of the "continuous process" type. Three "batch" processes are also described, namely, (1) the gelatin-tannin, (2) the clarase, and (3) the pectinol processes. The limitations of each of these processes are discussed. The analyses of various apple juices after the several treatments are given. "Pasteurization of apple juices at 170° for 20 minutes was found to give sterile products in which 'scorching' was not evident."

The industrial production of carbonated apple juice is described and discussed. It is concluded that a highly satisfactory carbonated apple juice for which a public demand may be expected may be produced.

A lubricant insoluble in organic solvents, C. C. Meloche and W. G. Frederick (*Jour. Amer. Chem. Soc., 54 (1932), No. 8, pp. 3264–3266*).—A note contributed from the University of Michigan describes a mixture, 25 g of anhydrous glycerin, 7 g of dextrin, and 3.5 g of chemically pure *d*-mannitol, heated nearly to boiling and cooled to room temperature. This preparation has excellent lubricating qualities as well as the body and adhesiveness suitable for most purposes. It is best stored in an ointment jar or kept in a desiccator, but exposure to laboratory air is not harmful. The reactions to it of a considerable number of organic liquids are listed.

AGRICULTURAL METEOROLOGY

The study of weather at agricultural institutes, N. Shaw (*Jour. Min. Agr. [Gt. Brit.], 39 (1932), No. 8, pp. 724–733, pls. 4*).—The author states that "everyone is aware that the growth of crops, the world over, depends on sunshine, warmth, and rainfall, and the questions which agricultural meteorology is designed to answer are, for any specific locality, how much sunshine, how much warmth, how much rainfall, and what distribution of those influences during the period of growth, or in anticipation of that period, are most favorable to the success of the crop." He then explains in general terms the instruments and equipment required, the kind of observations that should be made, records that should be kept, and their significance as an aid in attaining these ends. Special emphasis is laid on temperature because "temperature is the most vital consideration in agricultural meteorology, not only on

account of the immediate influence of the warmth of the air or the soil, but also for its associated influences."

Report on the phenological observations in the British Isles from December, 1930, to November, 1931, J. E. Clark, I. D. Margary, R. Marshall, and C. J. P. Cave (*Quart. Jour. Roy. Met. Soc. [London], 58 (1932), No. 246, pp. 321–376, figs. 8; rev. in Nature [London], 130 (1932), No. 3281, p. 443*).—This is a detailed summary and review of observations during the year. The report is based on data from 606 stations, 20 per cent more than for the previous year, including 17,000 individual records.

Summarizing the observations, it is stated that "the year was wet and dull. Temperature only diverged by −0.1° F., but as December (1930) and November (+2.6°) were the warmest the essential months were well on the cool side. Rainfall was in excess for the tenth successive year, yielding the average fall of 11. Worse still, save in England E., it was spread over an excess of days. This seriously hindered garden and field work and caused exceptional trouble from slugs and weeds. Dullness was yet more marked. The 13 plant events averaged half a week late for the British Isles, but six days for England and Wales. No single plant was early for all districts, though greater bindweed and harebell were not late. The floral isakairs reveal earliness over a tenth of the whole area, half being in N. E. Ireland. The 5 insects were nearly a week behind; spring migrants much less as the first comers were early. The new migrant isophene chart, showing the 16-year average arrival date, indicates early arrivals in 1931 on south and west coasts followed by retarded movement inland over England, but accelerated further north."

Climatological data for the United States by sections, [July-August, 1932] (*U. S. Dept. Agr., Weather Bur. Climat. Data, 19 (1932), Nos. 7, pp. [204], pls. 3, figs. 4; 8, pp. [200], pls. 3, figs. 3*).—These numbers contain the usual brief summaries and detailed tabular statements of climatological data for each State.

SOILS—FERTILIZERS

[Soil Survey Reports, 1928 Series] (*U. S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpts.], Ser. 1928, Nos. 23, pp. 40, figs. 2, map 1; 24, pp. 36, fig. 1, map 1*).—The two reports here noted deal with surveys made with the cooperation of the Michigan and the Iowa Experiment Stations, respectively.

No. 23. *Soil survey of Branch County, Mich.*, J. W. Moon et al.—Branch County, on the southern border of Michigan, possesses an area of 321,920 acres, largely level and without marked differences in elevation and drained by the St. Joseph River and various tributaries. The soils are classified into 18 mineral series of 24 types and 5 organic types. The largest areas are those of Hillsdale sandy loam, which covers 13.2 per cent of the total area, and Coldwater loam 10.6 per cent.

No. 24. *Soil survey of Sac County, Iowa*, C. L. Orrben et al.—Sac County, northwest of the center of Iowa, comprises an area of 367,360 acres, rolling to strongly rolling in the western, loess-covered section and level to gently undulating in the glaciated eastern part, and in part poorly drained.

Of 17 series and 19 types encountered, Marshall silt loam, Clarion loam, and Webster silty clay loam, occupying 36.2, 23.7, and 18.4 per cent of the total area, respectively, are the most extensive.

Profile characteristics of New England forest soils, H. A. Lunt (*Connecticut State Sta. Bul. 342 (1932), pp. 739–836, figs. 18*).—The results of a detailed and exhaustive investigation of typical forest soil areas of Connecticut and

New Hampshire are here presented in the form of a monograph dealing with the classification of the profiles, soil and vegetation of the localities sampled, physical properties, chemical properties, biological studies, distribution of tree species and lesser vegetation by profile types, and plant species mentioned. An appended bibliography cites somewhat more than 50 references.

"For this study profiles were grouped into the following types: Podsol, raw humus, humus, mild humus, and mull. . . .

"All of the soils are quite acid, with the H layer, where present, being the most acid portion of the profile. The upper horizons of the podsol and raw humus types are definitely more acid than the corresponding horizons of the mild humus and mull types.

"Differences between the podsol and nonpodsolized profiles are most strikingly shown in the distribution of iron, aluminum, nitrogen, and organic carbon in the two types. Based upon the analyses, the podsol types in New England are of the iron-humus type with no distinct separation of the iron from the humus. This is in distinction from the podsols of the Scandinavian countries, which are usually either iron or humus podsols or the iron-humus type in which most of the iron is in a layer separate from the humus. . . .

"Calcium is not concentrated in the B horizon as is the iron, but is more or less diffused throughout the whole lower profile. New England soils appear to be more deficient in lime than are the soils of Sweden reported by Tamm. Although the percentage composition of calcium in the duff is high, on an acre basis it is quite insignificant in amount when compared with that in the lower mineral horizons. The proportion of calcium in the exchangeable form is high (30–75 per cent) in the duff layers, and low (less than 5 per cent) in the B and C. On the whole the proportion is much less in forest soils than it is in good agricultural soils.

Magnesium equals or exceeds the calcium in amount present. Exchangeable hydrogen is highest in the H and B_1 layers of the podsols, and is closely associated with the organic matter content. Soluble phosphorus and exchangeable potassium are very largely confined to the organic portions of the profile.

"Ammonification occurred in practically all samples, but nitrification was generally very poor. The addition of lime caused the formation of nitrates at the expense of ammonia. Nitrogen transformation was greater in the F layer than in the H or A_1 horizons as a rule. Inoculation had but little effect, which indicated that if any stimulating or inhibiting substances exist in the inoculating material they are not extracted with water.

"Where treatments were used some benefit was observed. In no case did all of the added blood meal nitrify. Samples possessing a very wide C-N ratio required a large amount of nitrogen to permit the accumulation of ammonia or nitrates. A positive correlation exists between nitrogen transformation and pH, C-N ratio, calcium, and in some cases total nitrogen. . . .

"Some correlation between tree species and type of soil profile is apparent, but only to a limited degree. In the case of the lesser vegetation such a relation is even less evident. The type of profile that develops in the forests of Southern New England appears to be controlled to a large extent by the soil and related environmental factors and only indirectly by the vegetation growing thereon. Podsolization is a slow process and is not brought about within one generation of trees. Podsolization in the forest soils of the mountainous sections of New Hampshire is the rule rather than the exception, and results from a combination of factors, the greatest being climate and soil."

Some new Cuban Soils: A supplement to "The Soils of Cuba," H. H. Bennett (*Trop. Plant Research Found.* [*Yonkers, N. Y.*] *Sci. Contrib. 22* (*1932*),

pp. 64).—Since the publication of The Soils of Cuba, by Bennett and Allison (E. S. R., 59, p. 206), a number of new soil types and phases have been found as the result of surveys (1929 to 1932, inclusive) of areas which were not covered in much detail during earlier investigations. On the basis of these latter observations the present paper describes 59 new phases and types.

Preservation of soil monoliths, F. F. Morwick (*Sci. Agr., 13 (1932), No. 1, pp. 1–6, figs. 8*).—The author of this contribution from the Ontario Agricultural College uses commercial sodium silicate solution (water glass), diluted with three times its volume of water, as a binder; applying the solution to the smooth soil face and allowing 24 hours for hardening. He then attaches the hardened soil column to a backing board of suitable width by coating both board and silicated soil face with melted tar, reheating the tar layers to the melting point just before applying the board to the soil face. Strips 2 in. deep are attached to the sides of the board before attempting the removal of the hardened soil column from the profile, these strips completely framing the mount. Full working detail is given. The cheapness as well as the effectiveness of the sodium silicate as binding adhesive are emphasized.

Rapid methods of examining soils.—I, Measurements of rolling weights, R. K. Schofield and G. W. S. Blair (*Jour. Agr. Sci. [England], 22 (1932), No. 1, pp. 135–144, figs. 2*).—A method for measuring the heaviness of a sample of soil is described, the following advantages being noted: "(1) The test can be completed in about 7 minutes; no initial drying, sieving, or weighing is involved. (2) The apparatus is simple to construct and comparatively easy to work. The resultant figures are fundamental in nature, and not dependent on the dimensions of the apparatus used. (3) The property measured is the actual weight required to deform the soil, and is thus more fundamentally linked with heaviness than with such a property as the degree of subdivision as determined by mechanical analysis. (4) The test is done at a moisture content close to that obtaining under field conditions."

The *W* values obtained were closely related to drawbar-pull figures for a single field, and to clay content for a single group of soils, but soils of different types showed widely different *W* values for a given clay content. The value of *W* was considerably affected by the presence of salts in the soil. "The method is not suitable for the study of sandy soils, but this is not a serious disadvantage, since in sandy soils heaviness is not a predominant agricultural factor. The rapidity of the method should make possible an intensive survey of the soil within a given area on a scale hitherto impracticable."

The representation of soil analyses by the device of double plotting, W. H. Green (*Jour. Agr. Sci. [England], 22 (1932), No. 3, pp. 548–550, fig. 1*).—"There would appear to be several advantages in what may be called the method of 'double plotting,' in which two points are connected by a straight line." As shown in a diagram, both axes are used for two quantities; the "clay" and "silt" ends of the lines are indicated by arrow heads, while ends with circles denote the percentages of coarse sand and fine sand. "Thus, four values are directly charted on the graph."

"Further, from the simple geometrical properties of such a graph it will be seen that the middle point of the line represents (on a half scale) the summation of all four values, and, what is of more immediate concern, the distance of this point from the diagonal line drawn through the 50 per cent graduation on each axis gives a measure of the balance omitted. This 'omitted balance' is, of course, the loss on treatment with acid and hydrogen peroxide, and can not be indicated at all by either the triangular or tetragonal method of platting. Thus, the position, length, and direction of a single straight line show at a

glance all the characters of a soil which are revealed by the standard method of mechanical analysis."

Measurements of the electrical capacity and conductivity of soil blocks, G. H. Cashen (*Jour. Agr. Sci.* [*England*], *22* (*1932*), *No. 1, pp. 145–164, figs. 6*).—The equivalent parallel capacity and conductance of soil blocks were measured through a series of decreasing moisture contents, the results obtained being found to depend on the electrodes used. With mercury, all soils gave curves of the same general type for the variation of the capacity with moisture "because the capacity effects associated with the soil electrode interface are large compared with those due to the soil." The electrical properties of the interface were found to exhibit marked changes in their variation with moisture at certain moisture contents. The results obtained with carbon electrodes, though depending on the texture of the soil, generally agreed with the changes observed with the mercury electrodes.

"Of the four characteristic moistures found, the second is readily identified as Atterberg's 'Schwindungsgrenze' (the moisture at which air enters the pores), while the first appears to correspond with his 'Ausrollgrenze' (the lower plastic limit). The two lower moistures are hitherto unrecorded, but there are indications that at the lower one changes may occur in the variation with moisture of the shrinkage and cohesion of soil, and the rate of evaporation of water from soil."

The use of the Troemner balance for measuring the upper plastic limit of soils, L. D. Baver (*Jour. Amer. Soc. Agron., 24* (*1932*), *No 9, pp. 686–690, figs. 2*).—A shallow cup, provided with two diametrically placed notches intended to guide the spatula used in cutting the groove across the soil paste, is placed, according to the procedure of the Missouri Experiment Station, on the pan of a Troemner balance, and is forced up against the bottom of a shell vial, slightly smaller than the cup and fixed rigidly in a vertical position over the surface of the soil sample. Observations of the amount of the flow were made from above through the bottom of the glass vial. "The moisture content at which the soil will barely flow together is called the upper plastic limit. It was found that a weight of 1,000 g on the balance exerted sufficient force to give results comparable with those obtained by the hand method," and the results appeared to be somewhat more uniform.

The effect of climatic variations on the plasticity of soil, G. W. S. Blair and F. Yates (*Jour. Agr. Sci.* [*England*], *22* (*1932*), *No. 3, pp. 639–646*).—The plasticity of a soil, as measured by the flow-plasticity test, was shown to be correlated with the soil temperature and moisture. The measurement was made on a paste of the soil smoothed by working the mass of soil with water, and then forcing it through a fine sieve; but the flow plasticity of the paste was found still to depend on the climatic history of the soil from which it was prepared. The soil had, in general, a higher plasticity in cold and dry weather and a lower plasticity in warm and wet weather.

"The concentrations of soil in pastes having certain standard consistency constants were determined, but were not found to vary regularly with temperature or moisture. Comparisons were made on untreated, flattened, and dug soils, but no regular effect could be shown to have been produced by flattening or digging. The differences in the means of certain constants are well explained by the fact that each treatment was studied at a separate time (the tests on untreated soil running throughout the whole course of the experiment), and there were seasonal fluctuations in some of the properties both in the untreated and in the worked soils."

The present position of the theory of the coagulation of dilute clay suspensions.—A résumé, E. W. Russell (*Jour. Agr. Sci.* [*England*], *22* (*1932*),

No. 1, pp. 165–199).—In a paper contributed from the Rothamsted Experimental Station, the general theory of the coagulation of dilute clay suspensions is discussed under the heads of rapid perikinetic coagulation, slow perikinetic coagulation, orthokinetic coagulation of suspensions, the electrical double layer, the measurement of the electrokinetic potential, factors affecting the stability of disperse systems, the effect of electrolytes on the stability of colloidal suspensions, the effect of the exchangeable base on the stability of clay suspensions, and the coagulation of clays in alkaline media.

Leaching of mineral matter in some Alberta soils, A. Leahey (*Sci. Agr., 13 (1932), No. 1, pp. 7–15*).—The various horizons representing soils of the brown, black, and gray wooded soil belts were analyzed by the author of this contribution from the University of Alberta for silicon, aluminum, iron, calcium, magnesium, and phosphorus. Little leaching of any of these elements was found to have occurred in the brown soils. The black soils were found to have been leached of lime, but little movement of the aluminum or iron had taken place. The gray wooded soils had been leached of lime to a considerable depth, and the aluminum and iron had been translocated to a considerable extent. The gray wooded soils were the only soils severly leached.

The Alberta soil belts could be correlated fairly closely with the Russian system of soil classification.

Replaceable bases, hydrogen, and base-holding capacity of Alberta soils, N. Holowaychuk (*Canad. Jour. Research, 7 (1932), No. 1, pp. 64–74*).—Soils from three major soil groups in Alberta showed a relatively high content of replaceable bases with normal calcium, magnesium, and sodium-potassium ratios. The A_2 horizon of the wooded soils was lowest in replaceable bases, indicating excessive leaching. Excessive leaching was not found to have occurred in any of the horizons of the brown and the black soils. Losses by leaching in the brown and black soils appeared to have resulted mainly from the movement of water-soluble cations. Movement of base-exchange complexes from the A_2 horizon of the wooded soils appeared to have been due to dispersion rather than to disintegration. The excess silica in the A_2 horizon is considered to have resulted from disintegration of feldspars rather than from the breaking down of the base-exchange complex. Greater proportions of hydrolytic acidity were found in the A_2 and B_1 horizons of the wooded soils than in the black soils.

"The wooded soils appear to belong to the podsol group according to the Gedroiz system of classification."

Oxidation-reduction potentials and the hydrogen-ion concentration of a soil, L. G. Willis (*Jour. Agr. Research [U. S.], 45 (1932), No 9, pp. 571–575, figs. 3*).—In a study at the North Carolina Experiment Station the oxidation-reduction potential of Dunbar fine sandy loam, one of a group of naturally ill-drained soils of the lower coastal plain in North Carolina, strongly acid, and high in organic matter, varied inversely with the pH values produced by liming. A similar result was observed when the displaced solution from the limed soil was titrated with very dilute acid. It is considered that in the case of soils where this relation between oxidation-reduction potential and H-ion concentration holds, rates of liming must be gauged with reference to the possible effects of the increase in reductiveness of the soil at the higher pH values.

Soil moisture and crop production, S. Barnes and E. S. Hopkins (*Canada Dept. Agr. Bul. 130, n. ser. (1930), pp. 46, figs. 21*).—A wide variety of field experiments and observations at Swift Current, Saskatchewan, are reported, the results of which are applicable particularly to the western half of the Province of Saskatchewan and lead to the general conclusion that "over these

areas the periodical occurrence of rainfall deficiency requires that great care be exercised at all times in moisture conservation."

"Single value" soil properties: A study of the significance of certain soil constants, III–VII (*Jour. Agr. Sci.* [*England*], *20* (*1930*), *Nos. 3, pp. 407–416, figs. 4; 4, pp. 541–548, fig. 1; 22* (*1932*), *No. 1, pp. 200–211, figs. 3*).—The five papers here noted continue a series (E. S. R., 64, p. 418) of contributions from the Natal University College and the Rothamsted Experimental Station.

III. *Note on the technique of the Keen-Raczkowski box experiment*, J. R. H. Coutts (pp. 407–413).—A modified technic is described as being as accurate as the one earlier employed and more convenient. The results for pore space obtained by the new method were very nearly the same as those obtained by the old method. The old and new results for water retention and swelling were not the same, but were found to be related to one another by simple linear expressions; and correlations with other soil properties deduced from the older data were shown to be applicable also to the new.

IV. *A further note on the technique of the "box" experiment*, B. A. Keen (pp. 414–416).—This paper places on record "some hitherto unpublished data bearing on the technic of the method, obtained at Rothamsted some years ago by Prof. Ohga (S. M. Educational Institute, Mukden, Manchuria) and dealing with the effect on the results of the degree of packing to which the soil is subjected."

V. *On the changes produced in a soil by oven drying*, J. R. H. Coutts (pp. 541–548).—The loss of weight of a soil during oven heating could be determined satisfactorily in a suitable type of electrically controlled oven. Results obtained by heating soils to temperatures ranging from 50 to 250° gave smooth curves connecting loss in weight with rise in temperature. From this it was concluded that there is no sudden alteration in the structure of a soil when it is heated to 100°, and that the air-dry moisture of a soil, as determined with sufficient accuracy by the usual methods, "is a convenient empirical factor, but not a representation of any fundamental soil property."

An examination of the factors contributing to the observed total loss in weight of a soil when heated was made, and an explanation of the contributions made by the different types of soil water and by the soil colloids is offered.

VI. *On the changes produced in a soil by exposure to high temperatures*, J. R. H. Coutts (pp. 200–202.)—Measurements of the loss on ignition were found in the case of four soils of different physical type not to be affected by changes in the temperature of the furnace, provided that the temperature was above 600°. Errors in the determination of the loss on ignition were shown to be of the order of 1 per cent of the true value. It is considered that the loss in weight of the soils can be ascribed in the main to loss of free and interstitial water up to above 100°; to destruction of organic colloids between 100 and 250°; and to destruction of inorganic colloids at higher temperatures.

VII. *The moisture equivalent and some related quantities*, J. R. H. Coutts (pp. 203–211).—This paper reports determinations of the moisture equivalent of a number of samples of Natal and Sind soils, and describes a technic requiring only small quantities of soil.

"It is concluded that while with the latter (alkaline and saline) soils the moisture equivalent gives valuable information, it adds little to the data obtained by other methods for the Natal soils. The xylene equivalent of the Natal soils has also been measured; from the moisture equivalent and the xylene equivalent, the imbibitional water can be calculated if the specific gravity of the soil is known." Equations expressing the moisture equivalent and the xylene equivalent of the Natal soils in terms of their loss on ignition and

mechanical composition were worked out, and the significance of the relative values of the numerical coefficients in these equations is discussed.

A microscopic study of certain changes in the microflora of soil, H. J. Conn (*New York State Sta. Tech. Bul. 204 (1932), pp. 21, figs. 4*).—A slight change in the method recently proposed by Cholodny[1] for the direct microscopic study of the soil flora was made by the author of the original form of the direct method for the microscopic examination of the soil microflora. This method consists essentially in leaving a microscopic slide for several days or a few weeks lying against a cut surface of soil and then staining the film of microorganisms that has attached itself to the slide. The important modification made in the present work was that of keeping the soil in jelly tumblers under controlled conditions instead of inserting the slide directly in field soil.

The method proved particularly valuable for observing changes in the soil flora from fungi or Actinomycetes to bacteria or vice versa. The use of the method on an acid soil of high colloidal content indicated that the natural flora of fungi and Actinomycetes is more quickly changed to one in which bacteria predominate by increasing the moisture content than by addition of calcium carbonate. The moisture content at which bacteria predominate in this particular soil over the filamentous forms was found higher than that which normally occurs in the field during the growing season of plants.

Effect of certain soil bacteria on the growth of the root nodule bacteria, K. Konishi (*Mem. Col. Agr., Kyoto Imp. Univ., No. 16 (1931), pp. 17+IV*).—The effect on Rhizobia from peas, soybeans, and alfalfa of the concomitant growth in the same medium of various other microorganisms is reported upon. *Bacillus subtilis* inhibited all three species of nodule bacteria in liquid cultures but not in soil cultures, and *Bacterium coli* inhibited the alfalfa bacteria in solutions but not in soil cultures. In soil cultures the nodule bacteria of alfalfa were not inhibited by *Bacillus subtilis, B. mycoides, B. prodigiosus, B. fluorescens, Bacterium coli, Bacillus megatherium,* and *Bacterium aerogenes.*

From the observations recorded were drawn the conclusions "(1) that the influence of one kind of organism upon another depends not upon the organisms themselves but upon the conditions under which they are living in association . . . (2) that if the nodule bacteria fail to grow in a given medium, either on account of the enormous development of the associative bacteria or on account of certain toxic substances produced, they can be rendered nontoxic by the use of neutralizing agents."

Nitrate-assimilating soil bacteria, F. B. Smith and P. E. Brown (*Jour. Amer. Soc. Agron., 24, (1932), No. 9, pp. 749–754, fig. 1*).—Species of Azotobacter, Radiobacter, Aerobacillus, Pseudomonas, and Achromobacter were isolated by the authors of this contribution from the Iowa Experiment Station from soils in which nitrate assimilation had been observed. These bacteria were shown to be able to assimilate nitrates in pure culture.

The effect of additions of nitrogen on the decomposition of sugar cane trash under field conditions, M. B. Sturgis (*Jour. Amer. Soc. Agron., 24 (1932), No. 9, pp. 690–706, fig. 1*).—The depressive effect of cane trash chopped and turned into the surface soil in March lasted for three months at the Louisiana Experiment Stations, while trash applied at the end of October had decomposed sufficiently by the following April to have ceased to lower the available soil ammonia and nitrate.

It is stated that "by the addition of inorganic nitrogen with the cane trash at the rate of 5 lbs. of nitrogen per ton of fresh field trash and the incorpora-

[1] Cholodny, N. Über eine Neue Methode zur Untersuchung der Bodenmikroflora. Arch. Mikrobiol., 1 (1930), No. 4, pp. 620–652, figs. 29.

tion of the mixture within the surface 5 in. of soil, the rate of composition will be increased and the presence of available soil nitrogen insured." Also, "an early application of the trash alone with the supplemental nitrogen being added in the spring directly ahead of the crop would prove the more practical method for the use of trash."

The trash increased the soil nitrogen and organic matter, and its decomposition increased the availability of phosphorus 15 to 20 lbs. per acre during the earlier stages of the process.

The lignin fraction underwent a slow decomposition and tended to accumulate in the soil when the trash was buried, but when the trash was turned into the surface soil there was "no excessive accumulation from lignin."

Studies on the carbon and nitrogen cycles in the soil, IV–VIII (*Jour. Agr. Sci.* [*England*], *22* (*1932*), *Nos. 1, pp. 115–125; 2, pp. 291–299, figs. 3; 3, pp. 497–526, figs. 2*).—These papers add to the serial contribution previously noted (E. S. R., 68, p. 163) data relating to the topics indicated below.

IV. *Natural and artificial humic acids*, M. M. S. du Toit and H. J. Page (pp. 115–125).—The preparation of natural humic acids from soil, peat (Dopplerite), and "Adco," and of artificial "humic" acids from sucrose, cellulose, dextrose and glycine (Maillard), furfural, hydroquinone, and lignin, and their purification is described; and the elementary composition of these substances and their behavior under conductometric titration with ammonia is recorded.

The artificial products from sucrose and furfural did not behave as acids, but all the natural products, and the artificial products from cellulose, hydroquinone, and lignin possessed the properties of colloidal acids. Preliminary investigations into the "humification" of furfural and ω-hydroxymethyl furfural, and into the interaction of dextrose with amino bodies, are described.

V. *The origin of the humic matter of the soil*, H. J. Page (pp. 291–296).—The results so far recorded in this series of investigations are discussed with reference to their bearing on the hypothesis that the humic matter of soil is derived from lignin. "This hypothesis is supported, but since the artificial product prepared from lignin is nitrogen-free, whereas the natural product contains nitrogen, further progress in the elucidation of the nature and origin of humic matter is dependent on a study of the part played by nitrogen in the formation of humic matter and the form in which it occurs."

VI. *The extraction of the organic nitrogen of the soil with alkali*, R. P. Hobson and H. J. Page (pp. 297–299).—This paper reports a group of experiments showing that the alkali extraction of the nitrogen from soils of certain plats of the permanent experiments on Barnfield and Broadbalk at Rothamsted follows a course closely similar to that of the alkali extraction of carbon from the same soils.

VII. *The nature of the organic nitrogen compounds of the soil: Humic nitrogen*, R. P. Hobson and H. J. Page (pp. 497–515).—The nitrogen contained in purified preparations of humic acid obtained from Rothamsted soils could not be eliminated by "methods which would be expected to remove simple nitrogenous impurities." The distribution of the nitrogen in the products of hydrolysis of these preparations of humic acid by hydrochloric acid, as determined by the Van Slyke method (E. S. R., 26, p. 22), was shown to be similar to that found in the hydrolyzates of proteins. A mixture of egg albumin and artificial humic acid from lignin resembled soil humic acid in regard to the effect on its nitrogen content of various methods of treatment. In both cases, the greater part of the nitrogen could not be removed by the action of proteoclastic enzymes.

"The results obtained are compatible with the hypothesis that soil humic acid containing nitrogen consists of a complex composed of nonnitrogenous

humic acid and protein, and that the manner of association is more intimate than that involved in the formation of a colloidal 'salt' by the mutual precipitation, in acid solution, of a negatively charged acidic colloid (humic acid) and positively charged protein on the basic side of its isoelectric point."

VIII. *The nature of the organic nitrogen compounds of the soil: "Nonhumic" nitrogen*, R. P. Hobson and H. J. Page (pp. 516–526).—This paper presents the conclusion, drawn from an examination of the compounds remaining in solution after humic matter had been removed from alkaline extracts of Rothamsted soils by acidification, that from 30 to 40 per cent of the nonhumic nitrogen is present in the form of peptides (proteoses, peptones, and polypeptides), together with 5 per cent of free amino nitrogen and 12 per cent of ammonia.

"The peptides are largely colloidal and precipitated by basic lead acetate and by phosphotungstic acid. The remaining 40 to 50 per cent of the nonhumic nitrogen is mainly precipitated by basic lead acetate and is mainly nonbasic. The nonhumic nitrogen compounds are thought to be incorporated in the humic-clay gel, so that for the most part they go into solution only in solvents which dissolve the humic matter and only in proportion to the amount so dissolved."

Soil fertility, R. I. Throckmorton and F. L. Duley (*Kansas Sta. Bul. 260 (1932), pp. 60, figs. 21*).—Under the head of Kansas soils the bulletin divides the soils of the State into 15 groups according to their origin and briefly characterizes each; following which it takes up trends of fertility and crop yields, composition of the soil, available and unavailable material for plants, chemical and biological analysis of the soil, how soils lose and gain fertility, maintaining soil fertility, commercial fertilizers, use of lime, and the building up of run-down land. The treatment of the subject is of a semipopular nature.

[Soil and fertilizer studies in North Carolina], C. B. Williams (*North Carolina Sta. Rpt. 1931, pp. 21–33*).—Data are reported from the station and substations on the magnesium deficiencies of some representative sandy soil types, the response of peat and muck soils to copper sulfate and lime, the effect of pH of soil upon the prevalence of black root rot of tobacco, the development and classification of the Durham series of soil, fertilizer and lime requirements for crops in rotations, nitrogenous and other fertilizers for cotton, lime and phosphorus for corn, and fertilizers for wheat and sweetpotatoes. A part of the work was in cooperation with the U. S. D. A. Bureau of Chemistry and Soils.

Soil fertility and sweet clover production in Oklahoma, H. J. Harper (*Oklahoma Sta. Bul. 206 (1932), pp. 32, figs. 10*).—Report is made on an investigation into the soil factors interfering with the growth of satisfactory crops of sweetclover on Oklahoma soils.

The liming of acid soils was found important, subsoil acidity appearing quite as active as that of the surface soil in causing failures. Fine limestone was more effective than that containing large percentages of the coarser material. Phosphorus in addition to the limestone treatment was in several cases necessary to prevent failure of the crop. In some instances phosphorus alone prevented failure, but where the subsoil was acid or the surface soil showed a slight to medium acidity, lime or lime and phosphorus was required. Both rock phosphate and superphosphate were readily utilized by the sweetclover, and in slightly acid soils the rock phosphate gave yields larger than those produced by superphosphate treatment.

The application of potassium compounds did not, for the most part, increase the sweetclover yield. Farm manure did not increase the yield to an extent sufficient to justify its use.

Poor drainage in areas of high rainfall made satisfactory sweetclover production impossible, water-logging of the soil restricting root development.

Plant food and soil moisture proved important limiting factors in attempts to grow sweetclover with a nurse crop; and inoculation was also found necessary to the best results in acid soils and in areas in which crops cross-inoculated with sweetclover had not been grown.

The use of sweetclover as a source of nitrogen for winter wheat production was ineffective at the station farm, the removal of the greater part of the available soil moisture to a depth of from 4 to 5 ft., together with the production of available nitrogen, capable of stimulating vegetative growth, in relatively large quantities in the surface soil, proving very unfavorable to high wheat yields.

The effect of fertilizers on crop yields of different soils and on the composition of certain crops, S. C. VANDECAVEYE and G. O. BAKER (*Washington Col. Sta. Bul. 274 (1932), pp. 55, figs. 14*).—Report is made on the progress of a fertilizer plat project covering the State, and including in the work here reported results during the years 1926 to 1931 from 259 of the cooperative trials, together with those of six pasture fertilizer experiments.

Extreme variations in natural productivity among the soils examined were demonstrable, and the belief "that the problem of plant food deficiencies is one that is primarily and distinctly associated with the soil" was found to be strongly supported by the data obtained. Further conclusions noted are, in part, that "the maximum productivity of certain soils in western Washington is so low, even after treatment with relatively large quantities of fertilizers, that the advisability of using these lands for the production of general farm crops is questionable. On the other hand, the natural productivity of a relatively small number of soils is so high that any attempt to increase production further by the use of fertilizers is not economical at the present time. . . .

"The proper use of complete fertilizers on pastures on medium producing western Washington soils that are well supplied with moisture throughout the growing season or that can be irrigated economically during the dry season is good farm practice, not only because it greatly increases crop yields but also because it improves the quality of the pasture grasses and hay in regard to mineral content, notably that of calcium and phosphorus. . . .

"The results of 44 experiments with nitrogen fertilizers on winter wheat grown largely on the exposed yellow subsoil of the hilltops and upper slopes of Palouse soils located in the area receiving an average annual precipitation of 18 in. or more show that a treatment with 150 to 250 lbs. of nitrate of soda per acre, or the equivalent in some other nitrogen carrier, may be expected to give an increase in yield of approximately 3 to 4 bu. of wheat per 100 lbs. of this fertilizer when broadcast early in the spring. . . .

"Although the classification of soils in groups derived from similar parent material and developed under similar processes of soil formation exhibits specific general characteristics that are helpful in determining related plant food deficiencies, there is a need for further subdivision of the soils in regard to their common characteristics in texture and profile development to be associated with continued studies of the more detailed specific fertility requirements of the soils in the subgroups."

Efficiency factors and their use in determining optimum fertilizer ratios, W. A. HUELSEN (*Jour. Agr. Research [U. S.], 45 (1932), No. 11, pp. 675–704, figs. 12*).—By means of a critical analysis of certain factors calculated from experimental results and called efficiency factors, the optimum fertilizer treatments were "determined [by the author of this contribution from the Illinois Experiment Station] from a mass of apparently irrelevant and inconsistent crop yields without resorting to supplementary tests. This analysis

is essentially a study of the reciprocal effects of fertilizer salts upon each other as determined by crop yields. . . . The influence of fertilizer salts upon each other was found to follow certain definite trends, which may or may not have a wider application than the limits of this experiment." The reciprocal action of these salts is described.

"Nitrogen has a tendency to depress the efficiency of phosphorus when the latter element is applied in apparently insufficient amounts as a part of various fertilizer combinations; but if adequate amounts of phosphorus are included, small supplementary treatments of nitrogen increase the efficiency of phosphorus. Phosphorus applied alone in increasing amounts shows successive decreases in efficiency, but when used in combination with nitrogen, or with both nitrogen and potash, there is a consistent increase in efficiency.

"Phosphorus also influences the efficiency of nitrogen to a very considerable extent. When the phosphorus content in nitrogen-phosphorus mixtures and in complete fertilizers appears to be inadequate, the efficiency of nitrogen is depressed, but if it is adequate there is an appreciable increase in nitrogen efficiency. When applications of nitrogen are increased and phosphorus is held constant the smallest amounts of nitrogen are usually the most efficient.

"A study of the relations between nitrogen and potash indicates that these two nutrients have a reciprocal effect upon each other, and furthermore their relationship shows a tendency to be inverse, that is, under certain conditions high nitrogen and low potash have efficiency factors equivalent to those derived from low nitrogen and high potash. With the inclusion of phosphorus, however, a combination containing low nitrogen and high potash usually gives better results than one with high nitrogen and low potash.

"Phosphorus, in addition to being materially affected by nitrogen, is also subject to considerable change due to potash. The effect of potash is somewhat complex and does not manifest itself in the same manner under all conditions. Considered in terms of the influence upon yields of edible ears, potash seems to be most efficient when applied in relatively small amounts in combinations with phosphorus, but omitting nitrogen. The addition of nitrogen, as well as potash, gives rise to an inverse relationship in which phosphorus seems to maintain its efficiency in equilibrium when the potash dosage increases inversely to that of phosphorus. Considered from the standpoint of plant growth as determined by weight of green fodder, the efficiency of phosphorus tends to increase directly in relation to successive additions of potash. In general, the efficiency of phosphorus in various mixtures tends to increase in relation to the amounts applied.

"The efficiency of potash is influenced to some extent by phosphorus and tends to increase in mixtures of these two elements (nitrogen omitted) according to the amount of each applied. There is a slight tendency for potash in complete fertilizers to exhibit the same type of inverse relationship with phosphorus as that mentioned in the preceding paragraph.

"From a study of the efficiency factors it has been found possible to determine the optimum fertilizer ratios in this experiment without having direct recourse to the crop yields."

Experiments to determine the retentive powers of Aroostook potato soils for nitrogen, E. R. TOBEY (*Maine Sta. Bul. 360 (1931), pp. 187, 188*).—Percolator experiments to determine the retentive powers of Aroostook potato soils for nitrogen added in the forms of ammonium salts, nitrates, and urea are briefly noted.

Studies on calcium cyanamide, I–III (*Jour. Agr. Sci. [England], 22 (1932), No. 2, pp. 300–357, figs. 12*).—The group of papers here noted from the Rothamsted Experimental Station represents work "undertaken . . . with the object

of securing a better understanding of the use of cyanamide based on the study of its behavior in the soil and its effect on crops under a range of practical and experimental conditions."

I. *The decomposition of calcium cyanamide in the soil and its effects on germination, nitrification, and soil reaction*, E. M. Crowther and H. L. Richardson (pp. 300–334).—With respect to the rate of disappearance of calcium cyanamide in the soil with the formation of urea, it is noted that although the reaction undoubtedly proceeds according to the second order equation $HCN_2+H_2O \rightarrow CO(NH_2)_2$, this would behave as a pseudounimolecular reaction, since the solutions are so dilute that the concentration of one reactant (water) is greatly in excess of the other. "The formation of urea from cyanamide in soil is probably a heterogeneous reaction catalyzed at a solid surface, and the above simple logarithmic equation $\left[-\frac{1}{x}\frac{dx}{dt}=\frac{m}{w}\right]$ is equally in accordance with this catalysis under the condition that the amount of active surface covered at any time by cyanamide is proportional to the concentration of cyanamide in the soil solution."

Soils were found to differ markedly in the rate at which they decompose calcium cyanamide, but very few were found deficient in the requisite catalyst, and conversion to urea and ammonia was completed within a few days, provided that the calcium cyanamide was intimately incorporated with the soil.

Pot experiments with a range of soils showed that calcium cyanamide decomposed most rapidly in soils of high microbiological activity. The early stages of the decomposition proceeded so rapidly that within a few days the ammonia contents were practically the same whether nitrogen was added as ammonium sulfate or calcium cyanamide. The final stage of nitrate formation proceeded more slowly in soils treated with cyanamide. The extent of the retardation of nitrate formation from calcium cyanamide depended on the type of soil and the environmental conditions. In pot experiments it was reduced by improved aeration, and in field experiments it was slight in winter and negligible in spring.

"The toxicity to germinating seeds is caused by cyanamide itself. It falls off rapidly as the interval between applying the calcium cyanamide and sowing the seeds is increased, and is roughly proportional to the amount of cyanamide present during a short interval after sowing. . . .

"Under comparable conditions a dressing of calcium cyanamide should have the same effect on the lime supply of the soil as an equal weight of ammonium sulfate together with an equal weight of quicklime. In the regular use of calcium cyanamide there is the additional advantage that its lime is utilized efficiently."

II. *Microbiological aspects of nitrification in soils under varied environmental conditions*, B. K. Mukerji (pp. 335–347).—The commercial form of calcium cyanamide markedly increased the bacterial numbers of soils in uncropped pots and both the bacterial numbers and carbon dioxide production in flasks under laboratory conditions. Improvement in the aeration of soil cultures increased the numbers of bacteria and accelerated the production and disappearance of ammonia, and also reduced the initial nitrification lag and increased the final accumulation of nitrate from calcium cyanamide. Urea formed from calcium cyanamide disappeared much more quickly in soils aerated by daily shaking than in undisturbed soils. A technic to insure adequate aeration in microbiological and biochemical studies on soils was developed and was shown to give results more in accordance with those obtained under field conditions than were those obtained by the older methods for soil cultures.

Dicyanodiamide had a greater depressing effect on nitrate formation in soils than had calcium cyanamide, and the latter substance was much more toxic to nitrifying organisms in culture solution. "In soils the toxic effect of cyanamide is obscured by its rapid decomposition to urea."

III. *Storage and mixing with superphosphate*, H. L. Richardson (pp. 348–357).—"On storage under good farm conditions calcium cyanamide gained steadily in weight, the increase reaching about 10 per cent after 27 months. The percentage of nitrogen decreased at a practically equivalent rate, so that there was little change in total nitrogen. The form of the nitrogen remained practically unchanged for the first six months; by 12 months there was a slight reduction in cyanamide nitrogen and a slight production of dicyanodiamide—less than 1 per cent of the total nitrogen.

"In a farm mixture of calcium cyanamide and superphosphate (1:3) cooled by spreading in a thin layer after mixing, 16 per cent of the nitrogen was converted to dicyanodiamide in the fresh mixture and this increased to 25 per cent after one month's storage. More dicyanodiamide was produced in a series of laboratory mixtures of calcium cyanamide and superphosphate in which heating was allowed to take place. Dicyanodiamide production varied regularly with the composition of the mixtures, rising to a maximum of 50 per cent of the total nitrogen in the mixture containing 20 per cent of calcium cyanamide and falling to below 20 per cent of the nitrogen in the 50 per cent mixture."

Factors affecting manganese availability in soils, S. D. Conner (*Jour. Amer. Soc. Agron., 24 (1932), No. 9, pp. 726–733, figs. 3*).—The author of this contribution from the Indiana Experiment Station observed that a black silty clay loam found in northeastern Indiana, nearly neutral in reaction, high in nitrogen, phosphorus, potassium, lime, and organic matter, and containing a medium percentage of manganese, often fails to grow good oats. In pot experiments on this soil, oats were benefited by ammonium nitrate, ammonium sulfate, urea, hydrochloric acid, and by steam sterilization. Nitrate of soda, animal tankage, carbonate of lime, and the growing and turning under of sweetclover gave no benefit.

Manganese sulfate and manganese chloride increased the oats yields when the soil was made neutral or alkaline (E. S. R., 54, p. 450). Manganese did not show benefit when applied in addition to acid-reacting materials. "The failure of oats seems to be due to lack of available manganese, and is corrected either by adding manganese or by giving a treatment that will make the soil manganese more soluble."

The effect of liming soils on the availability of manganese and iron, L. G. Willis (*Jour. Amer. Soc. Agron., 24 (1932), No. 9, pp. 716–726*).—Without presenting new data or experimental observations, the author discusses at some length in a communication from the North Carolina Experiment Station theoretical considerations based on previously published work from the Rhode Island Station (E. S. R., 54, p. 450) and from other sources. A reference list of 32 items is appended.

Commercial fertilizers in 1931–32 and their uses, G. S. Fraps and S. E. Asbury (*Texas Sta. Bul. 460 (1932), pp. 43*).—In addition to the usual annual report on analyses, the bulletin notes a decrease of about 40 per cent in the general use of fertilizers in Texas, and a use of fertilizers for cotton which had "apparently decreased much more than 40 per cent."

AGRICULTURAL BOTANY

Plant physiology as horticultural theory, H. Molisch (*Pflanzenphysiologie als Theorie der Gärtnerei. Jena: Gustav Fischer, 1930, 6. ed., rev., pp. XII+*

368, figs. 171).—The seven sections of this publication as originally noted (E. S. R., 37, p. 220) are preserved in the present book, which contains the preface for each of the six editions, indicating the development of the work since 1916 under the hand of the author.

Biochemical studies on the bamboo, I–VII (In *Anniversary Volume Dedicated to Masumi Chikashige. Kyoto: Imp. Univ. Dept. Sci., Inst. Chem., 1930, pp. 119–193, pl. 1, figs. 41*).—The contributions constituting this collection comprise the following: Biochemical Studies on the Bamboo, I, by S. Komatsu (pp. 119–138); II, Chemical Development in the Growth of Bamboo Shoots, I, by C. Tanaka (pp. 139–148); III, Chemical Development in the Growth of Bamboo Shoots, II, by D. Kamiya (pp. 149–159); IV, Chemical Development in the Growth of Bamboo Sheaths, by T. Tashima (pp. 161–165); V, Chemical Development in the Growth of Bamboo Shoots, by K. Nishioka (pp. 167–173); VI, The Carbohydrates and Organic Acids of the Bamboo Shoots, by Y. Sasaoka (pp. 175–181); and VII, Seasonal Variations in the Chemical Compositions of the Madake (*Phyllostachys quilioi* F. M.), by T. Nagasawa (pp. 183–193).

Physiological researches on pollen, with special reference to the artificial germination of Gramineae pollen, K. Gotoh (*Mem. Faculty Sci. and Agr., Taihoku Imp. Univ., 3 (1931), No. 2, pp. 61–197, pls. 2, figs. 26*).—Nonalkaline glassware should be used for the artificial germination of pollen grains, especially in case of the cover glass of hanging drop cultures, in order to avoid upsetting the H-ion concentration of the solutions. The sensitiveness of the pollen grain to the osmotic value of the solutions is related to the elasticity of the pollen membranes and the consistency of the cytoplasm. The H ion and other cations which depend upon the colloidal characters of membrane and cytoplasm are important factors in the bursting and germination of the pollen grain.

The series of cations, when arranged according to the rate of bursting of pollen grains, is said to correspond to that of their penetrative power as indicated in case of *Impatiens balsamina* and *Lysichiton camtschatense*. Antagonism is found among cations, especially between the calcium ion and other cations in relation to germination and bursting of the pollen grains. Temperature influences are indicated, and other factors and relations are detailed.

Influence of external conditions on the blooming of rice, [I], II [trans. title], Y. Noguchi (*Japan. Jour. Bot., 4 (1929), No. 3, pp. 237–276, figs. 2; 5 (1931), No. 3, pp. 351–369, figs. 7*).—In the introductory section of this contribution it is stated that the first blooming of rice occurs when the temperatures at 8 a. m. range about 27 to 28° C. (80.6 to 82.8° F.). It occurs earlier for higher 8 a. m. temperatures, up to 32°. The most favorable temperature for blooming is 32±2°. Bursting of the anthers and pollination occurs at about 30°. The most favorable relative humidity for blooming is about 75 to 80 per cent. Sudden alterations in the morning are favorable to quick and abundant blooming. Complete saturation of the air is unfavorable to blooming. High humidity hinders bursting of the anthers and may lower the setting of the grain from the normal 86 per cent to 59. In open air, blooming may occur below 50 per cent humidity, but even below 70 per cent it is significantly lowered and it rarely occurs below 65. The temperature optimum is 30° when the humidity is 70 per cent.

Neither the opening of the anthers nor the pollination is hindered by dryness, but the setting of the grain is lowered apparently by the death of the stigma. The effects of other conditions are detailed.

II. *Pollen germination and pollen tube growth.*—Both pollen germination and pollen tube growth in the rice plants occur within certain temperature

ranges. The maximum is near 60°, the minimum below 10°, the optimum about 30°. The pollen tube is generally slender at low and thick at high temperatures. Both pollen germination and pollen tube growth are somewhat limited in case of high humidity or particularly by dryness of the air. Rice pollen grains show only slight resistance to water, in which medium only a few grains germinate. Abnormally small or great air moisture shortens the life of pollen. In darkness, germinability of pollen is lessened somewhat, pollen tube growth not at all.

The nutrition of higher plants with organic substances [trans. title], I. TANAKA (*Japan. Jour. Bot., 5 (1931), No. 3, pp. 323–350, figs. 3*).—Urea proved a good source of nitrogen in these experiments, which were carried out with *Sisyrinchium bermudianum*, *Plantago major asiatica*, and *Brassica chinensis*, testing the nutritive qualities of various substances, chiefly sugars (mostly found favorable) and organic acids (mostly negative, except in low concentrations). As a source of phosphorus lecithin was more readily assimilated than was phytin. Among the organic sulfur compounds, only cystine proved to any extent assimilable.

Relations between various physiological phenomena in plants and coloring materials appearing in vegetative organs.—II, Relations between assimilative activity and anthocyanin formation in Abutilon avicennae [trans. title], H. KOSAKA (*Jour. Dept. Agr., Kyushu Imp. Univ., 3 (1931), No. 2, pp. 29–45*).—The preceding contribution has been noted (E. S. R., 68, p. 29).

The formation of anthocyanin coloring material in stems and leaf stalks of *A. avicennae* undergoes changes corresponding to the content of assimilated material in the leaves, but showing an inverse relation to the rate of growth of the plant. Colorant formation is restricted in those plants in which assimilation is limited. The conclusion is drawn that the degree of coloration material formation is in general parallel to the amount of accumulation of assimilated material in the body tissues of the plant, in case of *A. avicennae*.

Physiological studies on anthocyanin [trans. title], L. W. KUILMAN (*Rec. Trav. Bot. Néerland., 27 (1930), pp. 287–416, figs. 3*).—The present elaborate investigation of the physiological conditions and activities of anthocyanin in plants was extended to cover a study of assimilation intensity of reddened leaves, also to any relation of anthocyanin formation to external factors.

Studies on the absorption of ammonia and nitrate by the root of Zea mays seedlings in relation to the concentration and the actual acidity of culture solution, T. L. LOO (*Jour. Faculty Agr., Hokkaido Imp. Univ., 30 (1931), No. 1, pp. 118, pl. 1, figs. 26*).—The reaction of the culture solution containing ammonium nitrate changes rapidly when it is in contact with the root system of *Z. mays*, the seedlings of which are correspondingly affected as to growth. The inequality in the absorption of ammonia and of nitrate from ammonium nitrate which chiefly causes the shift of reaction is strongly affected by the concentration of the nutrient solution, by its H-ion concentration, by the presence of other salt or ion, and by the seedlings growth and the nutrient demand in the solution.

When the concentration of the nutrient solutions is relatively high, ammonia is at first absorbed to a certain extent and nitrate very little if at all for a while until some ammonia has been absorbed; whereas if the concentration is relatively low, the nitrate is absorbed from the start. The reaction change caused by the inequality in the absorption of ammonia and of nitrate depends in the main upon the relative absorption of ammonia and of nitrate.

When the concentration of the culture solution is very high, much more ammonia than nitrate is absorbed by the seedlings, the acidity increases rapidly and considerably, the growth of the seedlings is much hindered, and in extreme

cases the seedlings die. If the concentration is low, nitrate is absorbed along with ammonia, and the acidity increase is not so striking as in case of the concentrated solutions.

If ammonium nitrate is much less concentrated than the other salts present, more nitrate than ammonia is absorbed, the reaction change is not governed by the difference in absorption of ammonia and of nitrate, and the solution becomes increasingly acid. Absorption of ammonia and of nitrate from a pure solution of ammonium nitrate is similar to that from a complete solution. Explanation is offered regarding these observations and others involving the wave forms in the absorption curve.

Carbon dioxide assimilation and limiting factors, T. H. VAN DEN HONERT (*Rec. Trav. Bot. Néerland., 27 (1930), pp. 149–286, figs. 19*).—Carbon dioxide assimilation is said to be a chain reaction consisting of at least a diffusion, a photochemical, and a dark chemical process, each of which may individually determine the velocity of the assimilation. Noting the fact that investigators have claimed considerable deviation from the principle or law announced by Blackman (E. S. R., 18, p. 923), the present author holds that such alleged deviation must be ascribed almost entirely to the fact that different chloroplasts in a leaf or a plant are subject to different conditions in regard to light and carbon dioxide. A method is discussed as devised and used in which this objection was evaded, the results from which are said to have agreed fairly well with Blackman's formulation, the deviations from the ideal Blackman curve being very slight.

"At temperatures between 12 and 20° C. a Q_{10}=1.87 was found under conditions in which temperature was the limiting facor, while a Q_{10}=±1 was found when light was the limiting factor." When carbon dioxide concentration is the limiting factor, the assimilation velocity, even in small, unicellular organisms, is determined by the diffusion process. The process, subsequent to the diffusion, is ascribed to an agent (presumably chlorophyll), having extremely high affinity for carbon dioxide. "Even at a carbon dioxide pressure of 1:100,000 atmosphere, it is already almost entirely saturated." The assimilation quotient O_2: CO_2 in Hormidium is presumably greater than 1, which it is thought may be related to the fact that the first visible assimilation product in this organism is an oil.

Influence of manuring on health in potato tubers [trans. title], J. J. JANSSEN (*Tijdschr. Plantenziekten, 35 (1929), No. 5, pp. 119–151, pl. 1; Ger. abs., pp. 147–149*).—The effect on tuber development and soundness is recorded of variation, limitation, and ratio alteration in the nutrients supplied to potato plants during growth.

Injurious effects of manganese and iron deficiencies on the growth of citrus, A. R. C. HAAS (*Hilgardia [California Sta.], 7 (1932), No. 4, pp. 181–206, pls. 4, figs. 15*).—Rooted cuttings of rough lemon, lemon, and orange were grown in solution cultures containing iron and manganese as required, and budded citrus trees in sand cultures were used to supplement the experiments in solution cultures.

Manganese was found necessary for the healthy growth of citrus cuttings in solution cultures, but while citrus leaves became yellowish green or chlorotic when manganese was deficient, they did not mottle. Manganese-deficient leaves in acute stages were found to absciss prematurely and the shoots die back. Such shoots were found to show a resinous excrescence or gum pockets from which gum was exuded. The roots of the citrus cuttings remained healthy in appearance even though manganese was deficient for top growth. This was thought to be due possibly to the roots having the first opportunity to absorb

manganese and that they did not transfer it in considerable quantity to the leaves during a manganese-deficiency period. The quick response of the growth of new leaves upon adding small concentrations of manganese to the culture solution was considered due to the healthy condition of the roots in the manganese-deficient cultures. Excessive concentrations of manganese brought about chlorosis even though iron was added to the culture solution in similarly large amounts. Iron was found essential for the healthy growth of citrus, a deficiency bringing about chlorosis. When manganese was deficient in citrus leaves, in most cases less iron appeared to be accumulated in the leaves. Mottle leaf of citrus was not shown to be a result of iron deficiency. It was found that manganese could not take the place of iron, nor could iron take the place of manganese.

Mycorrhizal studies.—I, Mycorrhiza of Mont Alto nursery stock, A. P. KELLEY (*Jour. Forestry, 28 (1930), No. 1, pp. 34–41, figs. 2*).—Forest tree seedlings and trees apparently depend for their intake of salts mainly upon mycorrhizas instead of root hairs. Little is known of nutrition in forest trees. In a study of Pennsylvania nursery stock, mycorrhizas were found on all species except catalpa, infection extending to the xylem as well as to the cortex.

Fruit-tree mycorrhiza around Ann Arbor, Michigan, A. H. SMITH (*Mich. Acad. Sci., Arts, and Letters, Papers, 11 (1929), pp. 243–248, pl. 1*).—A study was begun in October, 1928, as to what extent mycorrhizas may exist on fruit trees in this country, conditions allowing such occurrence, and types which may appear. Orchards of widely different types, ages, and conditions were selected for examinations. The laboratory work consisted of histological study.

Endotrophic mycorrhizas were found on all trees which were examined, though the ectotrophic type was not met with (even in situations favoring its development on other species of trees, and though tests were made on 30 apple, 14 pear, 12 plum, 6 cherry, and 2 peach trees). They were always found relatively close to the surface. Single infections are rare, and presumably they indicate an early stage of development. Local environmental variations may factor as regards the abundance of mycorrhizal occurrences.

Mycorrhiza and Scotch pine in the University of Michigan forest nursery, D. V. BAXTER (*Mich. Acad. Sci., Arts, and Letters, Papers, 9 (1928), pp. 509–516, pls. 4*).—This account represents work done at the University of Michigan forest nursery in connection with difficulties met in growing coniferous seedlings. *Rhizopogon rubescens* is reported, allegedly for the first time, as found in roots of Scotch pine (*Pinus sylvestris*) in the United States. The possible mycorrhizal relationships of this fungus with Scotch pine are discussed with reference to irregular growth conditions noted in the University of Michigan nursery, in the Chillicothe forest nursery, and elsewhere.

Influence of plant growth on bacteria [trans. title], G. GRÄF (*Zentbl. Bakt. [etc.], 2. Abt., 82 (1930), No. 1–7, pp. 44–69, figs. 5*).—A study was made of the influence of plant growth on the numbers and activities of bacteria in that part of the soil in which or near which the roots ranged in case of rye, clover, alfalfa, winter and summer barley, wheat, beets, and horse beans.

Bacteria were more numerous within than without the rhizosphere, or region of root range, and still more numerous on the root surfaces. Specific bacterial forms and activities are discussed.

Phototropism and the light-sensitive system of Phycomyces, E. S. CASTLE (*Jour. Gen. Physiol., 13 (1930), No. 4, pp. 421–435, figs. 8*).—Reaction time in direct growth response of the sporangiophore of Phycomyces to light consists of at least an exposure period during which photochemical change occurs, a latent period involving products directly consequent upon the photochemical

action, and an action time preceding the growth acceleration. These phases are discussed.

Negative variations in Nitella produced by chloroform and by potassium chloride, W. J. V. Osterhout and S. E. Hill (*Jour. Gen. Physiol., 13 (1930), No. 4, pp. 459–467, figs. 11*).—"The results of applying chloroform and KCl to Nitella indicate that a negative variation may be started whenever it is possible to set up along the protoplasm a gradient of potential difference sufficiently steep to produce the necessary outward flow of current. Successive variations may thus be set up."

The concentration effect with Valonia: Potential differences with concentrated and diluted sea water, E. B. Damon and W. J. V. Osterhout (*Jour. Gen. Physiol., 13 (1930), No. 4, pp. 445–457, figs. 3*).—"The concentration effect promises to be of considerable importance as a means of revealing properties of protoplasm otherwise unsuspected. . . . The concentration effect with sea water is shown to be practically the concentration effect for NaCl, the part played by the other salts in sea water being relatively small."

Hard seededness in yellow lupine [trans. title], I. Esdorn (*Wiss. Arch. Landw., Abt. A, Pflanzenbau, 4 (1930), No. 4, pp. 497–549, figs. 10*).—Seed of yellow lupine (at least in the climate of Hamburg) become impermeable (as to the testa) not while on the mother plant but in storage, the process of hardening being correlated with loss of water from the testa, that of softening again with water uptake. These changes are under natural conditions reversible, depending largely on temperature and the absolute humidity of the air during the period of storage, high warmth and dryness favoring hartschaligkeit. Particulars are detailed.

Plant material introduced by the Division of Foreign Plant Introduction, Bureau of Plant Industry, January 1 to March 31, 1931 (*U. S. Dept. Agr., Inventory 106 (1932), pp. 67*).—This inventory records 1,500 lots of seeds and plants introduced for testing in various parts of the United States.

GENETICS

A structural change in the chromosomes of maize leading to chain formation, R. A. Brink and D. C. Cooper (*Amer. Nat., 66 (1932), No. 705, pp. 310–322, figs. 26*).—A strain of corn from Manchuria was found to be segregating for partial sterility in Wisconsin Experiment Station studies. Crosses between partially sterile plants of the Manchurian corn, termed M-sterile, and the standard o-normal line gave a certain proportion of incompletely fertile offspring. The M-sterile corn showed 8 bivalents and a chain of 4 chromosomes at diakinesis. The M-sterile chain possesses 1 pair of chromosomes in common with the semisterile-2 ring. It was assumed that in M-sterile plants a terminal segment of 1 chromosome became detached from its normal position and affixed by its broken end to a nonhomologous whole chromosome. The 3-armed chromosome structure expected on this hypothesis in the heterotypic prophase was identified. When M-steriles were used as pistillate parents, about one-half the partially sterile offspring produced considerably more than 24 per cent of aborted pollen, and were termed high steriles. There was cytological evidence that the high steriles are hyperploids. The trisomic condition of the translocated segment leads to frequent nondisjunction.

An interchange in maize giving low sterility and chain configurations, C. R. Burnham (*Natl. Acad. Sci. Proc., 18 (1932), No. 6, pp. 434–440, figs. 2*).—A culture of corn giving semisterile-1 plants also contained plants having a low percentage of pollen abortion and 20 chromosomes—8 bivalents plus a chain of

4 chromosomes associated with the nucleolus. The chain of 4 seemed to involve the satellite chromosome, carrying the genes of the *Y–pl* linkage group, and the *P–br* group, which belongs to the longest chromosome. Interchange evidently occurred at the end of the chromosome in the satellite.

Studies of Euchlaena and its hybrids with Zea, I, II (*Ztschr. Induktive Abstam. u. Vererbungslehre, 62 (1932), No. 3, pp. 291–315, figs. 4*).—The two studies reported were carried on at the Cornell University and the California Institute of Technology.

I. *Chromosome behavior in Euchlaena mexicana and its hybrids with Zea mays*, G. W. Beadle (pp. 291–304).—The members of the haploid chromosome complement of Florida teosinte were found to show about the same relative size range as do the chromosomes of corn. Two of the teosinte chromosomes have median spindle attachments not found on any of the corn chromosomes. At least 3 Florida teosinte chromosomes differ from their corn homologues in having two deeply staining terminal knobs, and 5 of the remaining teosinte chromosomes have such terminal knobs on their long arms. The hybrids between either Durango and Chalco annual teosinte and corn show normal meiotic chromosome behavior and are highly fertile, whereas hybrids between Florida teosinte and corn show pairs unequal in size and very often univalent chromosomes during the first meiotic mitosis and are noticeably sterile. The fact that hybrids between Florida and Durango teosinte showed more irregularities during meiosis than did Florida teosinte × corn suggested that Durango teosinte did not arise from hybrids between Florida teosinte and corn.

II. *Crossing over between the chromosomes of Euchlaena and those of Zea*, R. A. Emerson and G. W. Beadle (pp. 305–315).—Studies of crosses between corn and perennial teosinte and three forms of annual teosinte demonstrated that crossing over occurs between the *C–wx* chromosome of corn and its homologues from Chalco annual teosinte and from perennial teosinte, but is completely or nearly absent in this region in hybrids between corn and Durango or Florida annual teosinte. Crossing over occurred between the *R–g*, *su–Tu*, *B–lg*, *Y–Pl*, *P–br*, gl_1–v_5, a_1–d_1, and *pr*–v_3 chromosomes of corn and their homologues from Durango teosinte; between the *R–g*, *su–Tu*, *B–lg*, a_1–d_1, and *pr*–v_3 chromosomes of corn and their homologues from Chalco teosinte; and between the *R–g*, *B–lg*, and *pr*–v_3 chromosomes of corn and their homologues from Florida teosinte. The frequencies of crossing over were not different significantly from those found in corn. Crossing over also appeared to take place between the *R–g*, *B–lg*, *Y–Pl*, gl_1–v_5, and a_1–d_1 chromosomes of corn and their homologues from perennial teosinte.

Inheritance studies of the reaction of selfed lines of maize to smut (Ustilago zeae), M. M. Hoover (*West Virginia Sta. Bul. 253 (1932), pp. 32*).—A report is given of studies of the inheritance of smut reaction in crosses between certain selfed strains of corn and on the relation between smut reaction and certain known heritable characters.

The F_1 plants from crosses between certain selfed lines of maize that differed in the amount of smut infection showed an amount of smut intermediate to that of the parent plants. The tendency of the offspring to resemble the parent lines in regard to the place of infection was less clearly defined than their reaction to the amount of smut. Direct and reciprocal crosses gave similar results. The results of crosses between certain selfed lines and representatives of nine linkage groups indicated that at least some of the groups were associated with smut susceptibility.

The F_3 progeny resulting from the intercrosses of the most resistant selfed lines indicated the possibility of isolating desirable agronomic types that are highly smut resistant.

It is concluded that in so far as the host is concerned two sets of genetic factors seem to control the reaction of any particular strain to smut. One group of factors is considered to be concerned primarily in the control of physiological behavior and the second concerned with the morphology of the plant.

Smooth-awned wheat: Inheritance of barbing and awn colour, S. J. SIGFUSSON (*Sci. Agr., 13 (1932), No. 3, pp. 185–193, figs. 3*).—Smooth-awned wheat plants appeared in progenies descending from a Marquis (common) ×Iumillo (durum) wheat cross studied at the Brandon, Manitoba, Experimental Farm. Observations on segregating families showed roughness of awn to be dominant to smooth awn, and black awn dominant to white awn, with single factors inherited independently of each other involved in each case. At least one auxiliary factor responsible for the fine and scattered barbs on the lower half of the awn in near-smooth plants also seemed to be present, but its effect was too small to give a clear distinction between phenotypic classes. Examination by W. P. Thompson showed the plants to be cytologically normal with 14 chromosomes in the haploid stage, and there was no evidence of lagging chromosomes. The theory of a natural cross, as well as of a gene mutation, was advanced to explain the origin of the smooth-awned character.

Genetics and breeding in the improvement of the soybean, C. M. WOODWORTH (*Illinois Sta. Bul. 384 (1932), pp. 293–404, figs. 34*).—Based extensively on research carried on at the station (E. S. R., 66, p. 223) and by other institutions, largely reported earlier, this publication describes the soybean plant and its method of reproduction; gives detailed consideration to the inheritance of seed and plant characters, including a list of genes and linked characters in soybeans; discusses variation as a basis of improvement and the merits of selection and hybridization as breeding methods; and reviews efforts to breed for oil and protein content, quality of oil, resistance to bacterial blight, bacterial pustule disease, brown spot, Fusarium blight, frog-eye leaf spot, and mosaic, and yield of seed. The bibliography includes 63 titles.

In an attempt made to analyze yield of seed into its components, i. e., numbers of nodes, of pods per node, and of seeds per pod, percentage of abortive seed, and size of seed, and to evaluate each of 26 varieties with respect to these components, any particular variety was found to rank well in one or more components and low in others, but no kind was found to rank highest in all. The several correlations indicated that varieties with a low percentage of abortive seed and with large seed tend to give the better yields. Varieties with small seeds tend to be high in number of nodes and of pods per node and in percentage of abortive seed, while varieties with large seed tend to have low values for these characters. Varieties with few nodes tend to have a low percentage of abortive seed, and varieties with many nodes tend toward the reverse.

Fertile gourd-pumpkin hybrids: The inheritance of factors for shape and color in summer squash-gourd-pumpkin crosses of Cucurbita pepo, T. W. WHITAKER (*Jour. Heredity, 23 (1932), No. 10, pp. 427–430, fig. 1*).—In this study at the University of Virginia successful crosses were made between the yellow flowered gourds (*C. pepo ovifera*) and the summer squash and pumpkin types of *C. pepo*. The pear shape of the gourd was recessive to the scallop shape of the summer squash, and the green body color of the pumpkin was recessive to the white body color of the nest egg gourd.

Inherited characters in the tomato.—I, The self-pruning habit, J. W. MACARTHUR (*Jour. Heredity, 23 (1932), No. 10, pp. 394–396, fig. 1*).—Discussing the growth habit of the determinate and the normal growing tomato varieties, the author reports that in crosses between the determinate or self-pruning tomato and normal plants the F_1 hybrids all produced their blossom clusters in

the normal succession with three intervening leaves and possessed stems of indeterminate growth. Thus determinate growth is recessive, and that it is controlled by a single Mendelian factor was demonstrated by an approximate 3:1 segregation in the F_2 progeny. In linkage determinations self-pruning was observed to be strongly linked with the potato leaf character; hence the IV linkage group of the tomato contains the loci of the genes controlling (1) cut leaf and potato leaf, and (2) normal and self-pruning habits of growth.

The chromosome constitution and pollenation of apples, M. B. CRANE (*Gard. Chron., 3. ser., 92 (1932), No. 2391, pp. 309, 310*).—In this contribution from the John Innes Horticultural Institution, Merton, England, there are listed the varieties of apples with triploid and diploid nuclear constitutions. Owing to their inherent sterility the fruit of the triploids contains many imperfect seeds, and since the pollen of diploids was more effective for triploids than their own, the practical suggestion is made that at least two diploid varieties be interplanted in all orchards. Since some of the finest commercial varieties, namely, Bramley Seedling in England and Baldwin in North America, occur among the triploids, their retention in pomology is necessary.

Double flowers and multiple fruits of the Japanese apricot, C. O. SMITH (*Jour. Heredity, 23 (1932), No. 10, pp. 411–414, figs. 2*).—Observations at the California Citrus Experiment Station on two double flowered seedlings of the Japanese apricot showed many multiple fruits, each component of which was of uniform size, normal shape, and contained a well-developed embryo. Each fruit had its own attachment to the stem and was not coalesced as in the case of twinned almonds, peaches, or plums.

Observations on the embryology of the badger, G. W. D. HAMLETT (*Anat. Rec., 53 (1932), No. 3, pp. 283–303, figs. 18*).—A study of the embryological development of the American badger showed that there is a delay of about two months in implantation, during which time the blastocysts lie free in the uterine lumen. The young are born about five weeks after implantation. The delayed development is apparently not the cause of twinning.

The origin of the cellular debris in vaginal smears of the guinea-pig, B. FRIEDMAN and J. IZMOR (*Science, 76 (1932), No. 1978, pp. 497, 498*).—By carefully dissecting the uteri of guinea pigs and studying their contents it is concluded that the origin of the large noncornified and cornified epithelial cells is the vagina. Small noncornified epithelial cells, often in clumps and sheets, come from the uterus, and the vagina and uterus furnish the source of leucocytes in considerable quantities.

The comparative sensitivity of the reproductive tracts of hypophysectomized and ovariectomized rats to follicular hormone, P. E. SMITH (*Amer. Jour. Physiol., 99 (1932), No. 2, pp. 349–356, figs. 4*).—No essential difference was noted in the comparative sensitivity of the uteri and vaginae of hypophysectomized and ovariectomized rats to injections of the follicular hormones.

The effect of the ovarian hormones theelin and corporin upon the growth of the mammary gland of the rabbit, C. W. TURNER and A. H. FRANK (*Missouri Sta. Research Bul. 174 (1932), pp. 28, figs. 26*).—A description is given of the influence of the estrogenic hormone and corpus luteum extracts on the development of the mammary gland in immature gonadectomized rabbits. It was found that the injection of 20 rat units of theelin for 30 days caused the growth of the duct system and slight lobule proliferation. On long-continued injection the duct system showed increased growth up to about 90 days, following which involution of the gland occurred. Although the injection of a physiologically active extract of the corpus luteum was ineffective in stimulating the growth of the ducts or lobules of the mammary gland, the simultaneous injection of this substance with theelin for 15 days caused a hyperplasia of

the gland lobules resembling that occurring during the first 15 days of pregnancy. It was possible to simulate the lactation phase of development normally observed during the second half of pregnancy by means of injections of extracts of sheep pituitary glands.

The effect of castration on the capacity of the hypophysis to induce ovulation, J. M. Wolfe (*Amer. Jour. Anat., 50 (1932), No. 3, pp. 351–357*).—The results of this test indicated that castration of female rabbits did not result in a hypertrophy of the anterior lobe of the hypophysis, although such hypertrophy occurred in female rats. The amounts of anterior lobe tissue necessary to induce ovulation were not materially influenced, although more anterior lobe material was present in the rats following castration.

The non-essentiality of the posterior hypophysis in parturition, P. E. Smith (*Amer. Jour. Physiol., 99 (1932), No. 2, pp. 345–348*).—The lack of an essential function in parturition of the posterior hypophysis in rats was demonstrated by the fact that six adult females, from which the posterior hypophysis was removed, were mated and produced litters, birth occurring at the usual time. Thus the secretion of the posterior hypophysis seems unnecessary either for genesis or the maintenance of the uterine contractions at parturition.

A probable case of double superfetation in the ewe, C. E. Aubel (*Jour. Heredity, 23 (1932), No. 4, pp. 159, 160, fig. 1*).—The author cites the case at the Kansas Experiment Station of a ewe that gave birth to one 8-lb. lamb on December 25, 1930, another weighing 8 lbs. on May 5, 1931, and twins weighing 6.5 lbs. each on July 25, 1931. All were ewe lambs. The last two births undoubtedly furnish a case of superfetation, and it is also suggested that service for the second lamb probably occurred before December 25, 1930.

Physiology of reproduction [in poultry] (*Maine Sta. Bul. 360 (1931), pp. 174, 175*).—Brief reference is made to studies of embryonic mortality in all eggs failing to hatch and success in distinguishing the sex of the young chicks by the presence or absence of the diminutive copulatory organ.

A probable new mutation to white-belly in the house mouse, Mus musculus, C. E. Keeler (*Natl. Acad. Sci. Proc., 17 (1931), No. 12, pp. 700–703, figs. 2*).—The occurrence of a mutation from *w* to *W* (white-belly) in the house mouse is noted.

Absence of corpus callosum, a hereditary brain anomaly of the house mouse.—Preliminary report, L. S. King and C. E. Keeler (*Natl. Acad. Sci. Proc., 18 (1932), No. 8, pp. 525–528, figs. 2*).—The absence of the corpus callosum of the brain was discovered in a considerable number of mice. This was thought to behave as a nonsex-linked hereditary factor, and was not closely linked with other genes studied.

Further studies on the genesis of abnormalities appearing in the descendants of X-rayed mice, C. C. Little and B. W. McPheters (*Genetics, 17 (1932), No. 6, pp. 674–688, fig. 1*).—In continuing the studies of the descendants of X-rayed mice (E. S. R., 66, p. 422), special attention has been given to an abnormality described as a swelling of the myencephalon in embryos 7 to 9 mm in length. This condition gives rise to a number of blebs full of colorless fluid, and this abnormality is inherited as a Mendelian recessive. Selection has been possible so that lines have produced from 9.1 to 0.7 per cent of this type of abnormality. A high embryonic mortality occurs in such strains, amounting to about one-half of the living abnormal embryos. No linkage relations were demonstrated except a supposed relation between the color gene and the gene for this abnormal character.

An empirical test of the approximate method of calculating coefficients of inbreeding and relationship from livestock pedigrees, J. L. Lush (*Jour. Agr. Research [U. S.], 45 (1932), No. 9, pp. 565–569, fig. 1*).—From the Iowa Experiment Station the author reports an empirical test, from 400 pedigrees of Rambouillet sheep, of the sampling method for calculating inbreeding and relationship coefficients, as suggested by Wright and McPhee (E. S. R., 54, p. 324). This study indicated that the method is as accurate as its theoretical probable errors indicate, but one must continually watch for the possibility of systematic errors creeping in where random selection is so important. Particular reference is made to the use of the same penny throw for determining two sequences from the same volume of the herd book or in the two lines running back from a single pedigree.

The progeny test in poultry breeding, D. C. Warren (*Kansas Sta. Circ. 168 (1932), pp. 24, figs. 7*).—Attention is called to the use of a progeny test in poultry breeding. It is pointed out that this refers to an estimation of the individual's value as a breeder and is based on the quality and performance of the offspring. A suggested short-cut progeny test based on the intensity of laying during the first 30 days is presented. This permits the collection of data on pullets which will enable placing their dams in breeding pens during the succeeding season and avoids the loss of the second year's services of the more valuable birds.

Observations on physiological factors influencing the genetic coloration of fowl plumage, G. H. Faulkner (*Ztschr. Wiss. Biol., Abt. D, Arch. Entwickl. Mech. Organ., 126 (1932), No. 4, pp. 663–673, figs. 2; Ger. abs., p. 672*).—Evidence is presented to show that in the Brown Leghorn fowl there is a direct correlation between the rate of growth of the feathers and the amount of black deposited in them. For example, in the cock a daily growth rate of 2 mm or more in the feathers was associated with black color, 1.5 mm with yellow plus a small amount of black, and a feather growth rate of less than 1.5 mm with red color. Reference is also made to a possible effect of the female hormone on melanin production and the occurrence of substances inhibiting the tyrosinase reaction.

Inherited (?) dwarfism in the fowl, R. L. Mayhew and C. W. Upp (*Jour. Heredity, 23 (1932), No. 7, pp. 269–276, figs. 3*).—The occurrence of dwarfed birds resembling bantams is noted from the Louisiana Experiment Stations. In such birds the legs were much shorter in proportion to the body size than in the normal fowl, the outer toes turned outward and backward, the beak was somewhat parrot-like, and the head was wider than normal in the region of the eyes. The body weight of such birds was considerably less than normal. This character appeared to be due to a recessive factor, and the viability of the affected birds was low.

The "penguin" guinea fowl, E. McCrady, jr. (*Jour. Heredity, 23 (1932), No. 5, pp. 201–207, figs. 4*).—A description is given of guinea fowl in which the flight feathers of the wing and tail were not developed and there was an accompanying reduction in pygostyl. This characteristic behaved as a recessive, and from the small numbers produced there was some suggestion that viability was impaired.

The inheritance by an insect vector of the ability to transmit a plant virus, H. H. Storey (*Roy. Soc. [London], Proc., Ser. B, 112 (1932), No. B774, pp. 46–60*).—Working at the East African Agricultural Research Station, Amani, races of the leafhopper species *Cicadulina mbila* Naude have been bred which are on the one hand able and on the other hand unable to transmit the virus

of streak disease in the natural process of feeding on maize plants. The crossing of the pure races has demonstrated that the ability to transmit is inherited as a simple dominant Mendelian factor, linked with sex.

FIELD CROPS

Crop yields and financial returns in a 5-year rotation of crops, T. E. Odland and S. C. Damon (*Rhode Island Sta. Bul. 235 (1932), pp. 16*).—Results obtained during the 14 years, 1917 to 1930, in a 5-year rotation (E. S. R., 41, p. 434), are reported with comments on the crops during the 38 years of this sequence. The rotation in later years comprised potatoes, squash, onions (replacing peas and turnips since 1904), wheat (replacing oats since 1917), and late cabbage (following the first hay crop since 1927). The potatoes, squash, and hay were continued over the entire period. Commercial fertilizers were the chief means for maintaining soil fertility, although four cords of manure were applied once during each cycle of the rotation.

Yields of all crops were maintained or increased, and the costs and returns showed that the rotation gave satisfactory money returns during its course. The estimated net returns per acre per year from crops grown in the period 1917–1930 were for hay $11.15, potatoes $151.86, squash $43.19, onions $119.12, wheat $13.28, and cabbage $65.56, and the average return for the rotation $80.83.

Comparisons showed that approximately 15 per cent less nitrogen was supplied by the fertilizers than was removed by the crops, and nearly 6 times as much phosphoric acid and about 33 per cent more potash were added than were removed. The soil apparently had a satisfactory content of total nitrogen and organic matter, indicating that the rotation and the fertilizer had maintained soil fertility.

Rotation and tillage experiments at the Lawton (Okla.) Field Station, 1917–1930, W. M. Osborn (*U. S. Dept. Agr., Tech. Bul. 330 (1932), pp. 35, figs. 3*).—Experiments reviewed for the period 1917–1930 were made to determine the crops best adapted to the region, desirable crop sequences, and the effects of continuous cropping and of different cultural practices on crop yields. Information is given on the agriculture of the region, the soil, and climatic conditions.

Cotton is indicated as well adapted and is the leading cash crop, and winter wheat, barley, and spring oats are grown successfully. Corn evidently can not be grown successfully on the tight upland. Kafir was found to be the best adapted grain sorghum, and sorgo (Sumac) produced the heaviest tonnage of feed. Feterita appeared more susceptible to chinch bug damage than kafir, yet may serve as a catch crop for feed. In seasons favorable as to climate and less severe in chinch bug infestation, fluctuations of broomcorn yields from different tillage methods were small. Cowpeas were found to be the most dependable legume on upland soils, and alfalfa surpassed sweetclover. Comparative yields of wheat, oats, and barley are tabulated and discussed.

Although the investigations did not show any cropping methods that might be depended upon to insure a good crop every year, well-adapted crops made satisfactory averages over a period of years. Wheat did not respond markedly to differences in time or depth of plowing. Yields from spring-planted crops generally were better on fall or winter plowing than on spring plowing. While listing and plowing were about equal in value as preparations for wheat, listing was inferior for row crops because of poor stands and retarded growth earlier in the season. Fallow was not of sufficient advantage to any crop to warrant the practice, and subsoiling was ineffective in overcoming drought and did

not result in satisfactory yield increases with any important crop. Applications of barnyard manure resulted in small average yield increases with cotton, corn, and sorgo, but reduced grain yields of kafir and wheat. Results with green manure showed little to recommend its use.

[Field crops experiments in Maine], J. A. CHUCKA and D. B. LOVEJOY (*Maine Sta. Bul. 360 (1931), pp. 178, 179, 180, 181, fig. 1*).—Experiments at Aroostook Farm, reviewed briefly, included fertilizer, green manuring, and rotation studies with potatoes, and variety tests with wheat, oats, and barley.

[Field crops investigations in North Carolina, 1930–31], C. B. WILLIAMS, J. H. BEAUMONT, M. E. GARDNER, and R. SCHMIDT (*North Carolina Sta. Rpt. 1931, pp. 33–46, 100, 101*).—Continued agronomic research (E. S. R., 65, pp. 126, 131), reported on from the station and substations, comprised variety trials with cotton for yield and wilt resistance, corn, wheat, oats, rye, soybeans, alfalfa, lespedeza, peanuts, Crotalaria, and tobacco for yield and disease resistance; breeding work with cotton, wheat, potatoes, peanuts, and soybeans; inheritance studies with cotton; cultural (including planting) tests with cotton and peanuts; intercropping of corn and soybeans; experiments with tobacco dealing with regular fertilizers, fractional applications, quantities of magnesium, sources of nitrogen and potash, nitrogenous top-dressings, and the effects on yield and quality of crop rotation and of soybeans, and the sulfur and chlorine derived from different potash salts; and cotton fiber studies concerned with source and care of seed (E. S. R., 66, p. 327), drag (E. S. R., 60, p. 793), cell wall diameter, and the effects of locality and fertilizer. Certain phases of the research were in cooperation with the U. S. Department of Agriculture.

[Farm crops studies in Pennsylvania] (*Pennsylvania Sta. Bul. 279 (1932), pp. 13–15*).—The progress of variety trials with oats, barley, and corn by C. F. Noll and H. B. Musser, and with soybeans by Musser, fertilizer tests on pasture by F. D. Gardner and S. I. Bechdel, and studies of the cooking quality of potato varieties by J. S. Cobb, is reported on briefly.

The influence of physical environment on the principal cultivated crops of Scotland, C. P. SNODGRASS (*Scot. Geogr. Mag., 48 (1932), No. 6, pp. 329–347, figs. 7*).—The influence of elevation, precipitation, temperature, soil type, exposure, and economic factors on the production of pasture, wheat, barley, oats, potatoes, root crops, rye and other rotation grasses, and minor crops is discussed for three regions in Scotland.

Plant breeding in New South Wales, H. WENHOLZ (*N. S. Wales Dept. Agr., Sci. Bul. 39 (1932), pp. 51, figs. 4*).—The breeding work with field crops, vegetables, and fruits, here reviewed for 1930–31, resembled earlier work (E. S. R., 66, p. 326) in scope.

The identification of certain native and naturalized grasses by their vegetative characters, R. F. COPPLE and A. E. ALDOUS (*Kansas Sta. Tech. Bul. 32 (1932), pp. 73, pls. 28*).—The recognition of forage plants by their vegetative characters is considered essential in the development of a sound pasture program. In a key designed for the identification of 26 important pasture grasses of Kansas, separation into 3 major groups is based on the cross sections of the leaf in the bud and the shape of the stems. Other characters are used for further segregation. The key is supplemented by illustrations and descriptions of the most important characters of these grasses, a glossary, indexes, and comments on the keys of others. Preliminary studies indicated that sod growth is more characteristic than greenhouse seedlings for the study of vegetative characters, that the earliest practical period for identification by vegetative characters is after the production of the second blade, and that the preceding year's growth is an additional means of identification.

Seed mixture trials in hay crops.—II, Influence of harvesting in the sowing year [trans. title], G. Nillson-Leissner (*Sveriges Utsädesför. Tidskr., 42 (1932), No. 3, pp. 168–174; Eng. abs., pp. 173, 174*).—Further observations (E. S. R., 68, p. 183) demonstrated that in mild autumns, when new meadows show abundant growth and infestation with clover stem rot (*Sclerotinia trifoliorum*), harvesting some time before winter frosts lowers the yield of the following year, especially when the legumes (late-flowering red clover and alfalfa) are grown alone. If the legumes are grown in mixtures with grasses this decrease in total yield is much smaller, affecting the grasses only. First-year legume plants competing with grass in the mixtures do not grow as vigorously and rapidly as in pure cultures and do not develop so many leaves and shoots after harvest as the grass, and consequently become more winter hardy. Likewise late-flowering red clovers in grass mixtures are not as heavily infested by stem rot as in pure cultures. Certain exceptions are noted.

A three-year study of the chemical composition of grass from plots fertilized and grazed intensively, J. G. Archibald, P. R. Nelson, and E. Bennett (*Jour. Agr. Research [U. S.], 45 (1932), No. 10, pp. 627–640, figs. 4*).—An extensive trial of the Hohenheim system of pasture management at the Massachusetts Experiment Station is reported on in detail for 1928, 1929, and 1930, supplementing an earlier account (E. S. R., 64, p. 133) and including analyses of 137 samples of grass.

The system resulted in considerable increases in the dry matter produced per acre and in its nitrogen content, and at the same time in a lower dry matter content of the fresh grass. Increases occurred in all other constituents except crude fiber. Nitrogen fertilizer had a very marked effect in producing a succulent grass and a relatively large quantity of dry matter.

Study of seasonal variations showed that the grass on the plats was best in quality in May, that June surpassed other months in quantity of grass, and that except in mineral content, September grass was comparable in quality with June grass. Decreased production in July was followed by as evident an increase in August, some constituents approximating their June production. The fertilizer treatment had little effect on seasonal variations in composition, except in calcium and phosphorus whose assimilation was evidently stimulated; however, it accentuated markedly the peak of production in June. A close correlation was indicated between amount of rainfall and production or recovery of the more valuable constituents of the grass, especially the nitrogen, phosphorus, and ether extract. Less fertilizer in the spring and more in the summer was suggested as one way, if practicable, to diminish the seasonal irregularities.

Seed preparation and planting methods for spring small grains, T. A. Kiesselbach and W. E. Lyness (*Nebraska Sta. Bul. 273 (1932), pp. 20*).—Experiments over various periods at the station dealt with the effects of grading and treatment of seed, time and manner of planting, and time of harvesting upon the production of oats, barley, and spring wheat.

Prolonged comparisons of various fanning mill grades of Kherson oats and of Nebraska No. 21 (a pure line from Kherson), in which yield differences were slight, suggested that the principal benefits from the use of the fanning mill were the removal of trash, weed seeds, and smut balls in infected wheat or barley.

Smut in smutted seed oats was controlled effectively by both formalin and an organic mercury compound. Formalin in various degrees of dilution apparently may be used successfully for smut control in oats, the best control and yields coming from 1 pint of formalin to 10 gal. of water sprinkled on

50 bu. of seed. Neither formalin nor the mercury compound affected loose smut of barley significantly, whereas in standard applications both gave almost complete control of covered smut.

Drilled oats slightly outyielded broadcasted oats and required less seed per acre. During 13 years Kherson oats made maximum net yields from a 6-pk. per acre seeding rate and Swedish Select from 12 pk. From 2 to 2.5 bu. of seed per acre seemed desirable for small-seeded varieties and 0.5 bu. more for large-seeded oats under average eastern Nebraska conditions. Barley yields indicated that a rather wide range could occur in planting rates without material effects on results, a rate of 8 to 10 pk. per acre appearing best for the region. During 14 years spring wheat and oats yielded less as the date of planting was delayed, whereas with barley very early planting resulted in a lower average yield, a moderately early date proving best. When planted March 19, March 31, April 10, and April 21, from 1925 to 1930, the relative yields of spring wheat were 107, 100, 93, and 65 per cent; oats, 104, 100, 91, and 85 per cent; and barley, 90, 100, 103, and 94 per cent. Kherson oats harvested from 1921 to 1930, when ripe and 2, 4, and 6 days before maturity, averaged 47.1, 45.9, 43.1, and 40.7 bu. per acre. Indications were that harvesting prematurely to improve the feed value of the straw may be at the expense of grain yield.

Oat and barley varieties under irrigation, J. E. Norton and L. Powers (*Montana Sta. Bul. 266 (1932), pp. 27, figs. 2*).—Variety tests made at the station from 1922 to 1929 showed Victory and Markton oats and Trebi barley outstanding for irrigated land in Montana. The relative merits and behavior of these and other varieties tested are set forth in some detail. It is pointed out that the choice of oats or barley as a feed crop for irrigated land may depend upon such factors as yield of feed per acre, date of maturity, cost of production, feeding value, and the value per acre as a cash crop. During the eight years Trebi barley averaged 3,873 lbs. of grain per acre; Victory oats, 3,955; Marquis wheat, 3,371; and Federation wheat, 3,748 lbs. Their respective estimated gross values per acre at average market prices were $49.39, $55.99, $56.19, and $64.08.

The edible Cyperus and its industrial uses (oil, sugar, starch, fiber, etc.), G. Stampa ([*Internatl. Rev. Agr.*], *Mo. Bul. Agr. Sci. and Pract.* [*Roma*], *23 (1932), No. 7, pp. 259–270, fig. 1*).—Information is presented on the culture of the chufa (*C. esculentus*), the composition of the tubers, the extraction and commercial separation of the several products, and on the uses of the chufa and its products.

The relation between catalase activity and vigor in inbred strains and crosses of corn seedlings, H. L. Chance (*Amer. Jour Bot., 18 (1931), No. 8, pp. 696–703*).—When the fresh weight of inbred-corn seedlings or the yield of the mature offspring expressed as a percentage of the yield of the commercial stock served as a measure of vigor in Cornell University studies, no significant correlation was shown between the catalase activity and vigor of the seedling. No relation or parallel appeared to exist between the catalase activity of the inbred strains and that of their corresponding crosses.

Water requirements of cotton on sandy loam soils in southern San Joaquin Valley, S. H. Beckett and C. F. Dunshee (*California Sta. Bul. 537 (1932), pp. 48, figs. 16*).—The irrigation requirements of cotton grown on Delano sandy loam soils and the effects of soil moisture deficiency on growth and yields were studied from 1926 to 1930, inclusive, at the U. S. Cotton Field Station at Shafter, in the San Joaquin Valley of California. A general description of the soil types, water supply, and climate of the area is given with results of preliminary observations of irrigation practices on commercial fields.

Cotton grown on field plats was given the following treatments during 1927 to 1930, inclusive: (1) Irrigation when the soil moisture content reached about 7 per cent; (2) irrigation when plants wilted at 4 p. m.; (3) irrigation when plants wilted at 9 a. m.; (4) high moisture content early in season, low in the last half of season; (5) low moisture content early in the season, high in the last half of the season; and in 1930 only, the supplementary treatments (1A), irrigation when the plants changed from light green to a dark bluish-green color, the total depth during the season being intermediate between treatments (1) and (2); and (1AA), intermediate between (1) and (1A), with irrigation when the soil moisture content to a 5-ft. depth averaged 5.5 to 6 per cent.

When grown with available moisture continuously present throughout the season to 5 ft. deep, a full stand of cotton used an average of 29.5 acre-in. per acre. With a reasonable efficiency in irrigation (70 to 75 per cent), from 30 to 36 acre-in. per acre evidently will be required during the growing season in addition to a preseason irrigation of 6- to 8-acre-in. per acre, the monthly requirements being about 6- to 8-acre-in. per acre in March or April; June, 4; July, 9; August, 11; September, 7; and October, 3 acre-in. Little difference was noted in the seasonal use of water when the plants were allowed to wilt at 4 p. m. and at 9 a. m., the quantities of water used averaging two-thirds of that of treatment (1). The quantities used in treatments (4) and (5) did not differ significantly, the use being 80 per cent of that of treatment (1).

Estimated average yields of lint per acre for the various treatments were (1), 1,034; (2), 766; (3), 603; (4), 697; and (5), 620 lbs.; and in 1930, treatment (1A), 717 lbs. and (1AA), 943 lbs. v. (1), 930 lbs. Continuous available moisture as in treatment (1) resulted in the most plants and bolls per plant, highest percentage of five-lock bolls, longest staple, highest lint index, largest yields, and lowest percentage of shedding. Cotton under treatment (3) was consistently lowest in number of flowers and bolls, five-lock bolls, and yields and highest in percentage of shedding. Results under treatment (2) consistently were between those under treatments (1) and (3). The effects of stress as under treatment (5) were evident in the slightly larger plant size, shorter staple, high percentage of green immature bolls at harvest, and comparatively low yields. Treatment (4) consistently outyielded treatment (5), but differed little therefrom in flowering, shedding, percentage of five-lock bolls, and weight of cotton or seed per boll. Treatment (1A) was intermediate between treatments (1) and (2) in water used during the season and in yield and other agronomic characters. Indications were that withholding water until the plants change color, prior to wilting, depresses the yield. The one year's trial with treatment (1AA) indicated that in this soil the average moisture content of the top 5 ft. could drop at least 6 per cent without diminishing yields.

Cotton plants grown in tanks 5 ft. deep and with an area of 4 sq. ft., comparable to field spacing, were smaller in size each year than those with the same irrigation treatment in the field, but they used 47 per cent more water and averaged 73 per cent more flowers and 45 per cent more seed cotton. The use-of-water curves had the same general shape for both tank and field plats. Tanks with a water table maintained at 30 in. through the season produced small, early maturing plants each year with a low yield of seed cotton and lint. Evidently in this soil type profitable cotton production is not feasible where the crop's only source of water is a water table 30 in. or more below the surface.

Cotton variety tests, J. O. Ware (*Arkansas Sta. Bul. 282 (1932), pp. 9, fig. 1*).—Variety tests with cotton in cooperation with farmers from 1925 to 1931, inclusive, and other tests at substations and on plantations showed Arkan-

sas Rowden 40, Delfos 6102, D. and P. L. 4–8, and Wilson Type Big Boll, in order, to lead in yield when the State as a whole was considered. These cottons appeared better adapted to varying conditions than other cottons tested in north, south, and east Arkansas.

The development of oil in the seed of the flax fibre crop and the variations in its character with maturity, M. F. Barker (*Jour. Soc. Chem. Indus., Trans., 51 (1932), No. 28, pp. 218T–222T, fig. 1*).—The seed of fiber flax ready to pull for fiber purposes, i. e., about three weeks after full bloom, are developed enough for good oil production, according to studies at the Linen Research Institute, Lambeg, Belfast. If properly afterripened, it was immaterial for either oil-seed or planting-seed purposes whether the capsules remained on the plant or were detached. Seed afterripened about two months and finally dried artificially contained 33 to 35 per cent of good pale oil, having an iodine value of about 175.

Some physiological studies of potatoes in storage, R. C. Wright (*Jour. Agr. Research [U. S.], 45 (1932), No. 9, pp. 543–555, fig. 1*).—Lots of Irish Cobbler, Green Mountain, and Triumph potatoes were stored continuously at 32, 36, 40, 50, 60, and 70° F. from November 5 until March 24, and the sugar content and respiration rate at these temperatures were determined periodically.

The sugar content steadily increased at 32° in all varieties until March 24. Analyses made June 1 showed a slight decrease. It increased markedly at 36° but to a less extent than at 32°, and increased slightly at 40° although the periodic results were fluctuating. At 50, 60, and 70°, however, the sugar content decreased steadily in proportion as the temperature increased.

The respiration of Irish Cobbler and Green Mountain potatoes increased at successively higher temperatures above 40°, being more rapid at 36 than at 40 or 32°. In general the respiration rate decreased as the storage period was prolonged. The carbon dioxide content of the internal atmosphere was found greatest in Irish Cobbler and Green Mountain tubers at 36° and in Triumph at 32°, while at other temperatures no apparent correlation was observed between internal atmospheric composition and temperature.

After storage at 32° until March 24, some of each of Irish Cobbler and Green Mountain potatoes were removed and held at 60°. The sugar content decreased steadily and rapidly, while the rate of respiration increased at first and then decreased. The carbon dioxide content of the internal atmosphere increased rapidly during the first 2 days and remained high for about 6 to 9 days before decreasing.

Green Mountain and Irish Cobbler tubers, after storage at 40° until March 11, were slightly frozen at 22° for 5 hours, then thawed at 40,° divided, and stored at 32, 40, 50, 60, 70, and 85°, together with unfrozen lots from the same temperature. After a month's storage, at most temperatures the potatoes frozen showed a somewhat higher sugar content than did the unfrozen potatoes. The frozen tubers, after thawing for 24 hours at 40° and stored at 60° for 24 hours to allow their temperature to come to room temperature, had a somewhat higher rate of respiration than comparable unfrozen tubers.

Pollination and seed production in the rye-grasses (Lolium perenne and Lolium italicum), J. W. Gregor (*Roy. Soc. Edinb. Trans., 55 (1928), pt. 3, No. 30, pp. 773–794, figs. 2*).—The course of pollination, both natural and controlled, in *L. perenne* and *L. italicum* is described in some detail, with observations on self-pollination, cross-pollination, and natural seed production, and on the mode of pollination in other perennial and annual British grasses.

Preliminary investigations on the cultivation of indigenous saltbushes (Atriplex spp.) in an area of winter rainfall and summer drought, H. C.

TRUMBLE (*Jour. Council Sci. and Indus. Research [Aust.], 5 (1932), No. 3, pp. 152–161, fig. 1*).—Cultural, variety, and germination tests, water requirement, and nutrition studies in South Australia demonstrated that several species of saltbush might readily be established from seed if proper attention be paid to moisture and temperature of the soil. Saltbushes are valued for timely and plentiful production, low water requirement, deep root system, and appreciable contents of protein, phosphorus, sodium, and chlorine. They suffer from competition with winter grasses and weeds, some species are short-lived, and nitrogen is needed in considerable quantities.

Sugar beet experiments, 1929 ([*Irish Free State*] *Dept. Agr. Jour., 30 (1931), No. 1, pp. 128–151*).—Continued experiments with sugar beets at different centers in the Irish Free State (E. S. R., 63, p. 230) showed the Kuhn P variety to surpass Kleinwanzleben E and Z and Schreiber SS in sugar yield and cash value per acre. The standard fertilizer dressing of 35 per cent superphosphate 4 cwt., kainit 4 cwt., and ammonium sulfate 1 cwt. per acre, applied just before planting, gave satisfactory returns compared with certain modifications of the dressing, although additional quantities of 25 and 50 per cent of the standard fertilizer gave profitable increases. Lime at the rate of 30 cwt. per acre applied in the winter before beets increased average yields and sugar contents very slightly, but where the soil needed lime badly even 1 ton applied at the time of preparation for planting gave profitable increases. The best results were obtained with 18-in. drills and singling when the plants had developed 4 rough leaves. With beets stored 8 to 10 weeks in the ordinary narrow straw-covered clamp, there was a decrease in sugar of about 6 per cent of the total weight of sugar in the beet. Indications were that such loss could be reduced further by storing in a narrow clamp sheltered from the sun and wind and covered with a layer of straw just deep enough to conceal the roots.

Variations in the organic reserves in underground parts of five perennial weeds from late April to November, A. C. ARNY (*Minnesota Sta. Tech. Bul. 84 (1932), pp. 28, figs. 12*).—The organic reserves, carbohydrates and nitrogen, in the storage organs of five perennial weeds were studied to obtain information of practical value in their eradication. Underground parts of quack grass and leafy spurge (*Euphorbia esula*) were dug November 11, 1927, and of these weeds and Austrian field cress (*Nasturtium austriacum*), sow thistle, and Canada thislte at about 10-day intervals from April 26 to November 5, 1928.

The percentages of total sugars and total readily available carbohydrates in the underground storage organs of each of the weeds except quack grass declined sharply from late April through the first part of May. The total readily available carbohydrates in the storage roots of leafy spurge and Austrian field cress, weeds resuming growth very early in spring, reached low points for the season by the middle of May, when beginning to bloom. Rapid storage followed for a time and continued at more moderate rates to the close of the season. In sow thistle and Canada thistle, weeds usually not appearing above ground until late April, declines in total readily available carbohydrates were very rapid at first and continued at more moderate rates to the first part of July, when the plants were in bloom. Reserves accumulated from then to the close of the season. Rhizomes of quack grass were lower in both percentage and pounds per acre of total readily available carbohydrates at the time of the first determinations than on any later sampling date. Readily available carbohydrates in underground storage organs of each weed except quack grass were low in relation to total reserve carbohydrates during the middle of July. Marked decreases took place in the percentages of

true starch and increases in sugars in underground storage organs of sow and Canada thistles and leafy spurge as the temperature lowered in fall, but evidently not in Austrian field cress and quack grass.

The rapid declines in total organic nitrogen observed in underground storage organs of sow thistle and Austrian field cress and the less marked declines in Canada thistle, leafy spurge, and quack grass early in the season, continued more slowly to August, after which increases occurred.

When Canada thistles were cut close to the ground once in full bloom growth was delayed the following year, compared with those not cut, but marked lowering of the reserves in the storage roots did not result. Opportune times for beginning eradication measures appear to be about May 15 for leafy spurge and Austrian field cress, and about July 1 also for these and for the other three weeds.

Weed control by sulphuric acid spraying in France, D. Skilbeck and H. G. Coles (*Scot. Jour. Agr., 15 (1932), No. 4, pp. 410–414*).—The methods used in France for controlling weeds in growing crops by sulfuric acid sprays and some of the results obtained are described from a survey, and preliminary trials made in 1931 near Oxford are reported on briefly.

Control of weeds with chlorates, J. W. Deem (*New Zeal. Jour. Agr., 43 (1931), No. 2, pp. 105–110, fig. 1*).—Additional trials of sodium chlorate (E. S. R., 65, p. 533) for the control of ragwort, blackberry, gorse, St. Johnswort, and other weeds are reported. Best results were had from solutions ranging between 3 and 10 per cent, with concentrations from 3 to 6 per cent preferred.

HORTICULTURE

[Horticultural investigations at the Maine Station], J. A. Chucka, D. B. Lovejoy, R. M. Bailey, I. M. Burgess, F. B. Chandler, and I. C. Mason (*Maine Sta. Bul. 360 (1931), pp. 181–185, figs. 3*).—Brief statements are presented on the results of lime trials on sweet corn and beans; on the development of new varieties of apples; on color mutations in the McIntosh apple; on the comparative value of standard varieties and hybrids of inbred lines of sweet corn; on variety and strain tests of various garden crops; on disease resistance of selfed lines of field beans; and on fertilizer, varietal, propagation, and cultural studies with blueberries.

[Horticulture at the North Carolina Station], C. F. Williams, J. H. Beaumont, I. D. Jones, M. E. Gardner, R. Schmidt, E. B. Morrow, G. O. Randall, and J. G. Weaver (*North Carolina Sta. Rpt. 1931, pp. 91–100, 101–105, figs. 3*).—Brief reports are submitted on the progress of investigations on the nutrition of the peach as affecting growth and fruiting; on leaf efficiency of the peach as affected by soil moisture; on fertilizer requirements of peaches in the sandhill and Piedmont areas; on peach pruning in the Piedmont; on apple pruning; on tree performance of pecans; on summer pruning and propagation of dewberries; on raspberry breeding; on variety and cultural trials with strawberries; on the relation of the age of strawberry plants to flowering and fruit production; on fertilizer and variety tests with lettuce; on general variety tests with vegetables; on variety tests of carnations, tulips, etc.; and on the relation of the chemical composition of cuttings of the Talisman and Briarcliff roses to their rooting.

[Horticulture at the Pennsylvania Station] (*Pennsylvania Sta. Bul. 279 (1932), pp. 15, 16, 17, 18*).—Brief statements are presented on the results of studies on fruit tree rootstocks, by R. D. Anthony; on ringing of fruit trees and on tree training by debudding, by F. N. Fagan; on promising new varieties of vegetables, by W. B. Mack; on the iodine content of Pennsylvania vegetables,

by Mack and E. P. Brasher; on cabbage breeding; and on improvement of head lettuce.

The conduct of manurial trials in the field, T. N. Hoblyn (*Univ. Reading Bul. 41 (1931), pp. 26–37, figs. 5*).—Various improvements in technic, such as adequate replication and randomization of plats, use of standardized plant materials, etc., that contribute to greater accuracy in horticultural investigations are discussed.

Substituting fertilizers, green manure, and peat for stable manure in the growing of vegetables, F. K. Crandall and T. E. Odland (*Rhode Island Sta. Bul. 234 (1932), pp. 53, figs. 9*).—In this contribution to a long-continued study (E. S. R., 60, p. 718; 64, p. 839) on the fertilization of market garden vegetables, further information is presented on the value of green manure crops and inorganic fertilizers as supplements or replacements for stable manure.

In general the results emphasized the value of stable manure in vegetable rotations. Celery was particularly responsive to manure, and in both celery and tomatoes the data obtained from 1916 to 1930 indicated the advisability of using some stable manure even where green manure crops were included in the rotation.

Of the three principal plant food elements nitrogen was the most important in influencing yield. Both early and late crops were benefited by more nitrogen in the standard fertilizer provided, with the possible exception of lettuce and celery in the green manure rotation. However, with early lettuce the greatest response to changes in percentage composition of ingredients was in the case of phosphorus, and with late celery of potassium. Nitrogen was a factor in hastening maturity in early cabbage and early tomatoes. On the other hand the earliness of the cabbage was not influenced by a reduction in phosphorus below that contained in the standard fertilizer, and in the tomato increases or reductions in phosphorus had comparatively little influence on yields, a fact believed due to the relatively large amount of phosphorus in the standard fertilizer employed.

When only the cost of the manure and fertilizer was deducted from the selling price of the crop, the returns per acre were greater from the stable manure rotation than from the green manure rotation.

Phases of the anatomy of Asparagus officinalis, C. H. Blasberg (*Bot. Gaz., 94 (1932), No. 1, pp. 206–214, figs. 10*).—Data are presented on the results of anatomical studies at the New Jersey Experiment Stations of asparagus plants of various ages, from seedlings to 12 years.

Asparagus fertilizer tests, H. L. Seaton (*Michigan Sta. Quart. Bul., 15 (1932), No. 2, pp. 110–115*).—Quantitative fertilizer tests with Mary Washington asparagus plants grown from seed sown in the spring of 1925 showed increased total yields from all fertilizer treatments. Approximately 1,200 lbs. per acre of a 4–8–6 or a 4–10–6 (N–P–K) fertilizer was apparently the most economical application. The largest returns were secured where the fertilizer was divided into a spring and summer application. An oat cover crop significantly increased yields in the later years.

The work of other stations is briefly reviewed, and general recommendations are given.

Cucumbers, S. G. Gabaev (*Ogurtsy. Leningrad: Vsesoûzn. Akad. Selsk. Khoz. Nauk Lenina, Inst. Rastenievod. [Lenin Acad. Agr. Sci. Inst. Plant Cult.], 1932, pp. 212, figs. 111*).—This monograph includes a compilation of the available literature and observations on a collection of 1,500 varieties of cucumbers assembled from all over the world.

Bermuda onion culture in Texas, L. R. Hawthorn (*Texas Sta. Circ. 65 (1932), pp. 14, figs. 4*).—Information of a general nature is offered.

Spinach under irrigation in Texas, L. R. HAWTHORN (*Texas Sta. Circ. 66 (1932), pp. 11, figs. 3*).—A presentation of general information.

Relative efficiency of various organic supplements in the growth of greenhouse tomatoes, B. E. GILBERT and F. R. PEMBER (*Rhode Island Sta. Bul. 236 (1932), pp. 15, figs. 2*).—Of five types of organic matter, (1) horse manure with straw bedding, (2) cow manure with straw bedding, (3) Adco-treated oat straw, (4) saw grass peat, and (5) vegetable compost, compared as soil amendments in the growing of winter crops of greenhouse tomatoes, the first three gave almost comparable yields, whereas saw grass peat and vegetable compost were considerably less effective. Attempts to regulate the nitrate supply in the several treatments proved ineffective, due apparently to the large amounts of nitrate produced during the decay of the organic matter. In fact where horse manure was supplemented with nitrogen yields were actually reduced, due apparently to the overvegetative condition induced.

The practical deduction is set forth that in greenhouse tomato culture where manures are available additional supplements of nitrogen are often unnecessary, except possibly during the latter part of the growth period when the organics have disappeared partially.

Effects of sulphur deficiency on metabolism in tomato, G. T. NIGHTINGALE, L. G. SCHERMERHORN, and W. R. ROBBINS (*Plant Physiol., 7 (1932), No. 4, pp. 565–595, fig. 1*).—In these studies, conducted in the greenhouses of the New Jersey Experiment Stations, Marglobe tomato plants started in soil and transferred to sand cultures supplied with nutrient solutions lacking in sulfur gradually developed definite indications of malnutrition. The upper half of the stem was very small in diameter and produced no axillary shoots but in length equaled those of the complete-nutrient plants.

The sulfur-deficient plants were extremely high in carbohydrates and contained much more nitrate than did plants receiving complete nutrients. The reduction of nitrates and the oxidation of sugars was comparatively slow but not entirely inhibited. The digestion of starch and the translocation of sugars occurred freely in the minus-sulfur plants. These plants had very thick cell walls and a relatively high proportion of fiber and lignified tissue. Cysteine specifically, probably glutathione, and possibly other S-H compounds were present in the meristematic tissues, and were especially abundant when complete-nutrient plants contained an abundance of sulfate and nitrate. Associated with low content of S-H sulfur there was in the minus-sulfur plants practically no active cambium. The considerable quantity of total organic sulfur in the sulfur-minus plants was largely water soluble, whereas that of the complete-nutrient plants was mainly in a complex protein form. Some evidence was secured that sulfur and ammonium may be formed proteolytically.

In the tomato the reduction of sulfate to sulfite and to S-H sulfur and of nitrates to nitrites and ammonium took place in a comparatively alkaline phloem region of the roots and tops. In the apple, asparagus, and narcissus the region of nitrate reduction was largely confined to the fibrous roots and sulfate reduction mainly to the tops.

Carbohydrate content of tomato fruit, L. G. SAYWELL and D. P. ROBERTSON (*Plant Physiol., 7 (1932), No. 4, pp. 705–710*).—At the University of California, in five lots of 15 to 20 individual fruits the sucrose range was from 0.02 to 0.07 per cent and of starch from 0.031 to 0.045 per cent. In a study of 17 samples obtained from important tomato-producing sections reducing sugars expressed in percentage of fresh weight varied from 2.95 to 4.01 and total solids from 6.05 to 8.13. Separating tomatoes into component parts, the tissues of the core region were relatively high in reducing sugars, total solids, and acid-hydrolyzable contents, and the walls approached the core in composition but were some-

what lower in reducing sugars. The authors conclude that the average sugar content of California tomatoes is somewhat higher than that reported for other sections.

The storage of tropically-grown tomatoes, C. W. Wardlaw and L. P. McGuire ([*Gt. Brit.*] *Empire Marketing Bd.* [*Pub.*] *59 (1932), pp. 50, figs. 9*).—Experiments conducted by the Imperial College of Tropical Agriculture, Trinidad, showed that the optimum storage temperature for tomatoes lies in the vicinity of 47.5° F., when both keeping and ultimate eating quality are considered. For long shipments the best success was had with tomatoes harvested in the full grown but green stage. Evidence was secured that the nonremoval of the calyx favors longer keeping in certain varieties. With respect to diseases, 50° appeared to be the critical temperature, and for this reason higher temperatures rapidly increase wastage. The better grades of Trinidad tomatoes were held in storage as long as 20 days, followed by a period of from 10 to 14 days during which they could be marketed.

Orchard and small fruit culture, E. C. Auchter and H. B. Knapp (*New York: John Wiley & Sons; London: Chapman & Hall, 1932, 2. ed., pp. XIX+584, figs. 278*).—This is the second edition of the work noted previously (E. S. R., 62, p. 228).

Fruit and berry growing [trans. title] (*Trudy Prikl. Bot., Genet. i Selek. (Bul. Appl. Bot., Genet. and Plant Breeding), 8. ser., No. 1 (1932), pp. 410, pls. 2, figs. 203*).—The following papers are presented, all with English abstracts: Horticulture in the District of Kara-Kala, by P. N. Bogushevskiĭ (Bogushevsky) (pp. 3–161); The Gooseberries of the Province of Leningrad, by Ю. Petrova (J. I. Petrova) (pp. 163–172); The Walnuts of Western Kopet-Dagh, by A. V. Gurskiĭ (Gursky) (pp. 173–199); On Wintering and Vegetative Reproduction of Some Rubus Species, by E. Semenova (E. P. Semenova) (pp. 201–222); Natural Hybridization in *Prunus silvestris* M. Pop., by K. F. Kostina (C. F. Kostina) and I. A. Linchevskiĭ (Linchevsky) (pp. 223–262); Purposes and Attainments of Scientific Research in the Field of Berry Growing, by M. A. Rozanova (Rosanova) (pp. 263–291); The Peaches of Fergana Valley, by K. Kostina (C. F. Kostina) and I. Rябov (I. N. Ryabov) (pp. 293–370); and A Survey of the Wild or Escaped Fruit Trees and Shrubs of the Crimea, by V. F. Vasil'ev (Y. P. Vasiliev) (pp. 371–410).

Fertility in relation to yield in cultivated fruits, M. B. Crane (*Univ. Reading Bul. 41 (1931), pp. 119–129*).—In this general discussion particular reference is made to generational and morphological sterility, relationship of chromosomes and fertility, polyploidy, constant hybrids, and cytological complexity of apples and pears.

Variation in the yields of fruit trees in relation to the planning of future experiments, E. R. Parker and L. D. Batchelor (*Hilgardia* [*California Sta.*], *7 (1932), No. 2, pp. 81–161, figs. 6*).—Utilizing as material yield and growth records which had been taken upon 199 8-tree plats of Washington Navel oranges for several years prior to the initiation of differential fertilizer treatments (E. S. R., 59, p. 335), the authors present the results of an analysis of the nature of the existing variations and their bearing on the accuracy of future experiments in the orchard.

During the 7 years in which yield records were taken prior to the differential treatments the distribution of yields of trees approached that of normal frequency curves in all except the first season, when a very high coefficient of variability was indicated. Except for this initial year there was noted a tendency for individual plats to yield about the same relative amounts.

A study of mean yields for the 6 years indicated that the use of single plats for each treatment would be unsatisfactory owing to the great differences that occur normally between them. The combining of contiguous plats decreased natural variations to some extent but was inadequate due to the correlation existing between such plats. The combination of systematically replicated plats of one treatment did, however, reduce variation approximately according to the expectations of random sampling.

Concerning check plat distribution, the greatest reduction in variation of adjusted yields was found when check plats were located at frequent intervals and when an interpolation or grading formula was used for the calculation of theoretical check yields of test plats. However, the most favorable gain in reliability obtained by adjustment to check plats was only slightly greater than that obtained by increased replication of test plats for each treatment made possible by the elimination of check plats.

Based on Student's formula, the use of methods of differences between test plats was found to give about the same reliability, with many treatments and a small number of systematically distributed replicates, as that obtained in direct comparisons between the means.

As a result of the study an experimental plan was evolved which provided on the basis of preliminary yields for four scattered plats for each treatment and for check plats also arranged with respect to previous yields. The mean yields of the four plats were approximately equal.

Measurements made of the trees showed that the sizes of trees in a single plat are apparently correlated. The variation of the size measures of single trees and plats of trees fluctuated very slightly from year to year; in fact tree size was less variable than yields, and since tree size was correlated with yield of the same year, it is admitted that size might be logically used as a basis for pairing trees or plats to be compared.

Factors governing fruit bud formation.—IX, A study of the relation between leaf area and internode length in the shoots of Worcester Pearmain apple, as affected by six different vegetative rootstocks, T. Swarbrick and K. C. Naik (*Jour. Pomol. and Hort. Sci., 10 (1932), No. 1, pp. 42–63*).—The ninth in a series (E. S. R., 60, p. 43), this paper presents evidence that rootstocks may modify internode length and leaf size of apples. A high correlation was shown in all six stocks between internode length and leaf area, and a definite relationship was established between the total leaf area of the terminal rosette of leaves and the earliness in fruiting, particularly in the terminal position. When figures for mean leaf area and mean internode length were expressed in a ratio, there was a direct correlation with the known earliness and fruitfulness induced by the rootstocks.

Bud variation in the apple, R. C. Palmer and C. C. Strachan (*Sci. Agr., 13 (1932), No. 3, pp. 178–184*).—Of 20 McIntosh apple trees planted at the Dominion Experimental Station at Summerland, B. C., in 1916, 10 produced striped and 10 self-colored fruits. The latter group gave rise to 15 limb variations bearing striped fruit, whereas the striped group gave rise to only one limb variation bearing selfed red apples. Scions of the striped and self-red McIntosh when inserted into a single tree produced fruit like their parents.

Grading the crop of the selfed-red and striped trees, it was found that over one-half of the crop of the red strain went into the extra fancy grade as compared with only 27 per cent for the striped strain.

Four distinct red sports of Delicious found in British Columbia graded out a much higher percentage of extra fancy apples than did the standard type Delicious. A considerable percentage (28 per cent) of the fruit of the solid red strains attained the extra fancy grade, as measured in skin color, while

yet green in the flesh. Since these green-fleshed apples were low in sugar content, it was evident that the early development of solid red color may not be altogether to an advantage and may complicate harvesting operations.

The inflorescences of apple trees: Their use in the identification of varieties, R. T. Pearl (*Jour. Pomol. and Hort. Sci., 10 (1932), No. 1, pp. 19–26, pls. 2*).—Observations at the South-Eastern Agricultural College, Kent, England, on some 60 varieties over a period of about 5 years showed that the season of flowering, arrangement of flowers, length and thickness of the pedicels, color of the buds, texture of the petals, shape and margin of the petals, relative length of styles to stamens, length of the style column, pubescence of styles and style column, pose of the flower, sepals, and stamens, and shape, color, glossiness, etc., of the young spur leaves are all important aids in identification of apples. Ten well known English varieties are described in accordance with the outline.

The use of alfalfa and other semi-permanent cover crops in the orchard, A. J. Heinicke (*N. Y. State Hort. Soc. Proc., 77 (1932), pp. 59–69*).—Asserting that on good orchard soils cultivation during May and June makes available about as much nitrogen to an acre as would be obtained from broadcasting 750 lbs. of nitrate of soda and at the expense of the organic matter present in the soil, the author discusses the results of soil management studies in a young apple orchard at Cornell University where cultivation plus cover crops, alfalfa sod, and grass sod, each with and without additional nitrogen, were compared. In all three plats there was a marked benefit from the supplemental nitrogen. The sod trees without nitrogen made the least girth increase, and those in cultivation with nitrogen the largest. With respect to nitrogen content of the leaves, the sod grown trees without nitrogen were the lowest. Where grass was cut in June the nitrogen content of the apple leaves was appreciably higher than where the grass was left standing until August, indicating that much of the nitrogen is locked up in the grass itself.

Moisture determinations of soil samples taken August 6 from the various plats showed somewhat higher moisture under alfalfa and grass cut June 10. A low moisture content on the cultivated plats was accounted for by a crop of volunteer weeds, but since growth on this plat was satisfactory it was evident that moisture differences were not sufficient to influence growth.

Yield records of two fertilizer experiments, L. C. Anderson (*N. Y. State Hort. Soc. Proc., 77 (1932), pp. 206–209*).—Fertilizer experiments conducted by the New York State Experiment Station in a McIntosh apple orchard located at Upper Red Hook showed that total production over an 8-year period was increased wherever nitrogen was applied, either singly or in combination. The benefits from nitrogen were more evident in the final years, suggesting that the trees were reaching an age where they showed a definite response to nitrogen. No evidence was found that either phosphorus or potash had materially increased yields.

In a comparable experiment with Delicious trees located at Rock Tavern the trees receiving the heavier applications of nitrogen gave in general higher yields, with the size of fruits correspondingly increased. Color was off somewhat in the nitrogen plats but not enough to affect market value.

Some effects of fertilizer upon storage response of Jonathan apples, F. L. Overley and E. L. Overholser (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 572–577*).—Observations at the Washington College Experiment Station upon the keeping quality of Jonathan and Winesap apples harvested from fertilizer plats showed no consistent measurable effects of fertilizer upon firmness of comparable samples. However, to the extent that fertilizer influenced size, color, and time of maturity, it also affected firmness. The highest average

pressure readings were on fruit from the plat receiving potassium only and which produced the smallest and most highly colored fruits.

In 1930 tests on Jonathan it was observed that the percentage of breakdown increased with an increased leaf area per fruit, but whether this resulted from larger fruit alone or whether some other predisposing condition developed is questioned. That seasonal conditions are also a factor in the percentage of breakdown in the Jonathan was shown in widely different amounts for the four years 1928 to 1931. In 1929 apples from all fertilizer plats ran high in breakdown percentage and were softer after three months' storage than was the case in any of the other three years.

The pollination problem in 1931, L. H. MacDaniels (*N. Y. State Hort. Soc. Proc., 77 (1932), pp. 37–43*).—In experiments conducted by the New York Cornell Experiment Station the Cortland apple was found satisfactory and Lobo, Early McIntosh, and Kendall fair pollinizers for McIntosh. McIntosh and Lobo pollinated Cortland successfully.

That placing bees and bouquets of compatible blooms in an orchard may not always insure successful pollination, even during favorable weather, was indicated in the spring of 1931 when the bees were observed to leave a McIntosh orchard and work in a near-by cherry orchard. However, bees are considered the best pollen carriers available to orchardists.

A starch-splitting enzyme in apple tissues, C. P. Harley, D. F. Fisher, and M. P. Masure (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 561–565*).—The total inability of the juice expressed from the pulp of apples of various degrees of maturity to digest starch paste and the inactivity in starch digestion of apple seeds when macerated with the pulp suggested the presence in the expressed juice of an effective diastase inhibitor. Attempts to separate diastase from the inhibiting substance by dialysis proved futile, but working on the hypothesis that the enzyme and the inhibitor might be confined in different phases of the same cell, a successful method of separation was devised which involved the neutralizing of the inhibitor and the precipitating of the enzyme simultaneously with the mixing of the cell's contents. Water extracts of the dried residue contained an active starch splitting enzyme, particularly when the substrate was buffered to the optimum pH for apple diastase.

Experiments on the storage of pears in artificial atmospheres.—II, Subnormal oxygen atmospheres with and without the addition of carbon dioxide, S. A. Trout (*Jour. Pomol. and Hort. Sci., 10 (1932), No. 1, pp. 27–34*).—In this second contribution (E. S. R., 62, p. 841), Comice pears stored for periods up to 84 days at a temperature of 3° C. (37.4° F.) in an atmosphere containing as little as 2 per cent of oxygen were only slightly retarded in ripening, and the fruits were of normal character. However, when oxygen was reduced to 0.2 per cent, ripening was greatly retarded, and following the treatment pears were slower to ripen in 10° in air than were controls. In low oxygen the pears developed unusual amounts of alcohol and acetaldehyde and were less sweet than the controls. With 0.2 per cent of oxygen the addition of carbon dioxide had little effect. All of the carbon dioxide treatments affected flavor but caused no visible internal or external injuries.

Trends in peach production, F. C. Bradford (*Michigan Sta. Quart. Bul., 15 (1932), No. 2, pp. 115–118*).—Analyzing records presented in the 1930 United States Census, the author points out the need for table varieties of peaches preceding and following Elberta in the belief that a succession of varieties would permit the marketing of a larger total crop than is possible with a single variety. The comparative regularity of peach crops in Michigan is deemed a material advantage.

Peach insects and diseases and how to control them, C. H. Alden (*Ga. State Bd. Ent. Bul. 71 (1930), pp. 31, figs. 15*).—This bulletin lists with brief discussion the various peach insects and diseases and discusses insecticides and fungicides for their control.

Orchard variability in maturing the Italian prune, L. R. Tucker (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 578–582, fig. 1*).—Surveys made in 1930 and 1931 by the Idaho Experiment Station of the changes in firmness and sugar content of Italian prunes prior to harvest showed some general differences from year to year according to the orchard in which grown. In 1930 and 1931 prunes softened at the rate of 0.30 and 0.25 lb. per day, respectively, and sugar content increased at the average rate of 0.26 per cent per day in 1930 and 0.19 per cent in 1931. Considerable differences between orchards were observed in the sugar content at a certain firmness, and irrigation was found to be a contributing factor in some cases. At the recommended picking firmness prunes varied in sugar content and in flavor. A study of 110 prunes from one tree showed a correlation of 0.16 ± 0.06 between firmness and sugar content. With samples from 40 trees correlations of 0.844 ± 0.022 were established between flavor and sugar content and -0.85 ± 0.021 between flavor and firmness, suggesting that sugar content and firmness have about equal effects on flavor.

Methods of measuring strawberry leaf areas, G. M. Darrow (*Plant Physiol., 7 (1932), No. 4, pp. 745–747*).—Three methods of measuring leaves, (1) leaf product, (2) matching, and (3) adjustable platform-planimeter, are discussed and data presented on their comparative speed and accuracy in measuring strawberry leaf areas.

The Aberdeen and Washington strawberry varieties, J. S. Shoemaker (*Ohio Sta. Bimo. Bul. 159 (1932), pp. 205–207, fig. 1*).—A brief description is given of the Aberdeen strawberry, and both varieties are discussed with respect to their general behavior on the station grounds.

Grafting as a method for investigating a possible virus disease of the strawberry, R. V. Harris (*Jour. Pomol. and Hort. Sci., 10 (1932), No. 1, pp. 35–41, pl. 1, figs. 2*).—In studying the possibility of transmitting suspected virus diseases, successful unions were obtained by cleft grafting and inarching the stolons of runners but not by grafting the main crowns.

Further notes on the nutrient requirements and the histology of the cranberry, with special reference to the sources of nitrogen, R. M. Addoms and F. C. Mounce (*Plant Physiol., 7 (1932), No. 4, pp. 643–656, figs. 2*).—Continuing work with cranberries (E. S. R., 67, p. 40), observations on Howe plants grown in sand cultures in the greenhouses of the New Jersey Experiment Stations and supplied with nutrient solutions the nitrogen of which was derived from calcium nitrate, ammonium sulfate, and glycine, respectively, indicated that the cranberry can utilize all three sources, but that nitrates are least favorable. Employing three degrees of acidity with each nitrogen, the best growth of the ammonium sulfate plants occurred at pH 6 and 8, of calcium nitrate plants at pH 4, and of glycine plants at pH 4 and 6. Obviously the cranberry was capable of utilizing ammonium under slightly more acid conditions than certain other plants, such as the tomato. The ability of the cranberry to thrive in a somewhat higher H-ion concentration in bog soil than in sand is attributed to the greater buffer properties of the bog soil. Glycine was apparently absorbed directly. The analysis of bog plants showed a correlation between degree of vegetative vigor and concentration of fats and lipoids in the leaves, the most vigorously vegetative plants having the lowest concentration of ether-soluble substances.

Mycelium of the endophytic fungus is found throughout the stem tissues, especially in parenchyma and in cells of embryonic tips, the amount of mycelium

being closely correlated with the vigor of the tissues. The belief is expressed that if under two environments plants are produced which in all visible respects resemble each other these plants will not differ materially in histological structure or in content of elaborated materials.

Influence of the season of planting on the rooting of grape vine cuttings, G. QUINN (*So. Aust. Dept. Agr. Bul. 253 (1931), pp. 11, figs. 4*).—Under the conditions of the experiments (South Australia) vinifera grape cuttings of a single variety planted in July produced the highest percentage (98) of rooted plants, but those planted in May and June produced stronger plants. The most favorable temperature during the month subsequent to setting out of cuttings was about 55° F. in the shade 4 ft. above ground level.

Cacao, C. J. J. VAN HALL (*London: Macmillan & Co., 1932, 2. ed., pp. XVIII+514, figs. 178*).—A second and revised edition of the previously noted work (E. S. R., 32, p. 745).

Uniformity trials on cacao, E. E. CHEESMAN and F. J. POUND (*Trop. Agr. [Trinidad], 9 (1932), No. 9, pp. 277–288*).—An analysis of data accumulated at the River Estate by the Trinidad Department of Agriculture suggested that with trees reasonably homogeneous with respect to age an experiment laid out on the Latin square system with from 12 to 18 trees per plat should show treatment differences of the order of 30 per cent. The use of two or three years' previous records applied by the Sanders' method may double the precision possible with one year's data. With cacao trees heterogeneous for age, field trials can not be expected to yield reliable results unless previous records of natural yield are available.

The fruitfulness of cacao, F. J. POUND (*Trop. Agr. [Trinidad], 9 (1932), No. 9, pp. 288–290, fig. 1*).—On the basis of studies at the River Estate, Trinidad, the author concludes that in fields heterogeneous for type and age there is a high significant positive correlation between mean annual yield of pods per tree and the total tree-to-tree variance. This correlation is believed due to the fact that in any good crop year the yield of high bearing trees draws away from the yield of poor producers. The good producers had a greater capacity for increase of yield than the low producers. Two factors, namely, size and age on the one hand and inherent characteristics on the other, are thought to be involved in yielding capacity.

Citrus experiments, R. O. WILLIAMS (*Trop. Agr. [Trinidad], 9 (1932), No. 10, pp. 301–306, figs. 2*).—A presentation of the experimental program of the Department of Agriculture, Trinidad.

Botanical discoveries on the citrus flora of China, T. TANAKA (*Mem. Tanaka Citrus Expt. Sta., 1 (1932), No. 2, pp. 12–36*).—Discussing the early history of citrus in the Orient, as revealed in botanical writings, the author presents the results of a personal survey in Taiwan (Formosa) and elsewhere and of a survey by C. C. Hu, of the University of Nanking, made along the Chinese coast. Among important findings was the discovery of *Citrus junos*, hitherto known only in the interior of China, along the coast of China. Evidence was secured that the Satsuma orange was comparatively recently introduced into China from Japan, and apparently did not occur in China before the Japanese recognized its economic value. *Fortunella hindsi* was found as far north as Huangyen.

Propagation of citrus fruits in Japan, T. and Y. TANAKA (*Mem. Tanaka Citrus Expt. Sta., 1 (1932), No. 2, pp. 1–11*).—A comparison of the trifoliate orange (*Citrus (Poncirus) trifoliata*) and the Yuzu orange (*C. junos*) as rootstocks for nine varieties of oranges, lemons, and grapefruit showed the Yuzu stock to promote the more vigorous growth over a long period. In the case of Satsuma, plants on Yuzu produced in their early years larger, later matur-

ing, and more acid fruits, with thicker and rougher skins. Thomson, Hyûganatsu, and Maltese Blood oranges grew well for a short time on trifoliate stock and then declined rapidly. The Yuzu stock was deep rooted, while the trifoliate produced a mass of shallow spreading roots. Data are presented on the grafting congeniality between 28 varieties of citrus.

Observations on progress of fertilizer trials at Citrus Experiment Station, E. R. Parker (*Calif. Citrogr., 17 (1932), No. 10, pp. 386, 420*).—Working with carefully selected trees planted in 1917, the California Citrus Experiment Station observed that during the third 5-year period of the orchard's existence applied nitrogen and organic matter had increased yields. Under the conditions of the experiment phosphoric acid, potash, limestone, gypsum, and sulfur were not effective. Only moderate quantities of nitrogen were required to increase yields.

Interesting type of water injury to citrus trees, J. C. Johnston (*Calif. Citrogr., 17 (1932), No. 10, p. 402, figs. 5*).—Following the rainy winter of 1931–32, considerable wilting of citrus trees, particularly Valencia oranges, occurred in central California about the first of March. An examination of the root system showed the root tips of the affected trees to be dead, thus destroying the water absorbing system and rendering the tree susceptible to transpiration injury with the advent of warm weather. In some instances the trees when properly drained subsequently recovered by putting forth a new crop of leaves during the summer.

Citrus experiments at the State Experimental Orchard, Berri, G. Quinn and N. S. Fotheringham (*So. Aust. Dept. Agr. Bul. 254 (1931), pp. 7*).—A study of eight years' production records of Washington Navel oranges grown on a soil naturally rich in calcium carbonate and fertilized with various combinations showed beyond doubt that the immediate limiting factor in the growth and production of citrus trees in the Murray Valley, South Australia, was the restricted supply of nitrogen. The average annual yield expressed in pounds per acre ranged from a minimum of 788.9 lbs. for one of the phosphorus plats to 11,820 lbs. for a sulfate of ammonia treatment.

Influence of number of leaves on growth of Wash. Navel oranges, A. D. Shamel and C. S. Pomeroy (*Calif. Citrogr., 17 (1932), No. 10, pp. 394, 396, fig. 1*).—In a 28-year-old commercial orchard at Corona, Calif., branches were girdled in early June and enough leaves removed to obtain 10, 20, 30, 40, and 50 per fruit. The branches with 50 leaves represented about the normal leaf condition of the trees. Measurements of the circumference of the fruits at intervals of about 1 month from time of ringing to harvest showed the lowest rate of growth in the 10 leaf per fruit group and the highest in the 50 leaf class, suggesting that at least 50 leaves per fruit are necessary in order to produce valuable commercial sizes of the Washington strain of oranges under conditions such as obtained in the experiment. Oranges located on the north side of the tree grew more rapidly than comparable fruits located on the south side of the same tree.

A monograph of the Satsuma orange with special reference to the occurrence of new varieties through bud variation, T. Tanaka (*Mem. Faculty Sci. and Agr., Taihoku Imp. Univ., 4 (1932), pp. VII+626, pls. 53*).—In this comprehensive treatise are discussed the origin and early history of the Satsuma orange, its present status in Japan, the tendency to mutation, and description of many of the more important strains.

Studies on summer cover crops in a Pineapple orange grove, W. E. Stokes, R. M. Barnette, H. W. Jones, and J. H. Jefferies (*Florida Sta. Bul. 253 (1932), pp. 18, figs. 4*).—A total of four summer legumes, one volunteer non-

legume, a rotation, and clean culture were studied with respect to their comparative effects on tree growth, fruit yields, and soil conditions.

Fruit yields were largest on the Crotalaria and rotated plats, and in general there was observed a direct correlation between the quantity of the cover crop material incorporated in the soil and the fruit yield. Over the 7 years Crotalaria produced an average yield of 4,969 lbs. of air-dried top growth per acre, twice that produced by velvetbeans, beggarweed, or cowpeas, and considerably more than the nearest competitor, Natal grass. Tree growth, as measured by the cross section area of the trunk, was comparable in all plats during the first few years, but toward the close was largest on the Crotalaria plats and least on the clean culture area.

Determinations of the decomposed organic matter in the upper 8 in. of soil showed a slight decrease over the 7 years, despite the plowing under of cover crops, but only in the clean culture plat was the loss significant. In all except the clean culture plat nitrogen content was maintained. pH readings of the aqueous suspensions of the soil showed but little variation between plats, all evidencing an acid condition.

Citrus maturity tests: Résumé of three years' experiments, 1929–31, R. J. Benton and F. T. Bowman (*Agr. Gaz. N. S. Wales, 43 (1932), No. 7, pp. 533–540, figs. 3*).—In connection with data showing the relation of acid content to palatability of oranges and grapefruit the authors describe the acidity test, stating that oranges are generally ready for harvest when not more than 23 c c of decinormal caustic soda are required to neutralize 10 c c of the expressed juice. Evidence was found that the decrease in acidity is slower after harvest, especially if the fruit is held at a low temperature, 42° F.

Living with our flowers through the four seasons of the year, Mrs. W. S. Rowe (*Cincinnati, Ohio: Stewart Kidd, 1932, pp. 374, pls. 15, figs. 40*).—The everyday needs of both indoor and outdoor plants are outlined month by month and season by season.

Photoperiodism: The value of supplementary illumination and reduction of light on flowering plants in the greenhouse, A. Laurie and G. H. Poesch (*Ohio Sta. Bul. 512 (1932), pp. 42, figs. 10*).—In this paper are presented the results obtained in growing a large number of garden and indoor flowering plants under modified light conditions, that is, either lengthening the daily illumination period by the use of artificial light or abbreviating the period by shading the beds. Certain species were found to flower distinctly earlier when the day was lengthened, others responded to abbreviated days, and still others evidenced no response.

Because of the low intensity required in the supplementary lights the practice is deemed to be commercially feasible where the cost of electricity is reasonable. In some instances growth was slightly weaker in the long day than under normal light conditions but not enough so as to interfere with market values. Chrysanthemums produced under reduced daylight were equal in quality to the normal day crop, except that stem length was somewhat shorter. Black sateen cloth gave satisfactory results and showed promise of enduring for several seasons.

Microchemical tests of plants in the high-nitrogen plats with reduced daylight showed large amounts of nitrates present and traces of starch and reducing sugars. Heavy applications of ammonium sulfate did not retard flower formation.

Growth irregularities in hybrid Freesias induced by X-rays, W. P. Morgan (*Ind. Acad. Sci. Proc., 47 (1931), pp. 139–144, figs. 4*).—At the Indiana Central College it was found that X-ray treatments of Freesia corms hastened growth but caused distortion of resulting leaves and foliage in proportion to

the intensity of the dosage. Foliage produced by corms grown from X-rayed seeds also showed abnormal growth. With an increase in intensity of dosage growth was retarded to the point of death.

Response of iris to soil reaction, J. H. Gourley (*Plant Physiol., 7 (1932), No. 4, pp. 739–742, figs. 2*).—*Iris germanica* planted on September 1 in the Ohio Experiment Station greenhouses in beds established at pH degrees ranging from 4.5 to 8 showed up to the end of four months no appreciable differences in growth or color. Thereafter a darker color and a larger leaf growth was noted in the plants in the pH 7.5 and 8 beds, with some stunting and tipburn in the 4.5 and 5 plats. At the end of 18 months the plants on the most acid soil had become practically worthless, and there was a fairly consistent gradient from this plat up to the most alkaline.

A simple guide to rock gardening, J. L. Cotter (*New York: Macmillan Co., 1932, new ed., pp. X+11–126, pls. 12*).—Special chapters are devoted to those plants considered of chief importance in rock gardening and those most suitable for special purposes, together with general information on culture and propagation.

FORESTRY

Exotic forest trees in the British Empire, R. S. Troup (*Oxford: Clarendon Press, 1932, pp. VIII+259, pls. 4*).—Descriptions and comments are presented on a large number of exotic trees under trial in the British Empire.

Commercial timbers of India, I, II, R. S. Pearson and H. P. Brown (*Calcutta: Govt., 1932, vols. 1, pp. XLV+548, pls. 364; 2, pp. IX+549–1150, pls. 276*).—A general account of their distribution, supplies, anatomical structure, physical and mechanical properties, and uses.

The maple products industry of Pennsylvania, A. C. McIntyre (*Pennsylvania Sta. Bul. 280 (1932), pp. 47, figs. 16*).—Interspersed in a general discussion of the maple sirup and sugar producing industry of Pennsylvania are various experimental results. For example, hydrometer readings of the fresh sap showed that sugar content decreases with the advancing season, that it increases slightly during the day as compared with the night, and that the sap taken from different spouts on a single tree may differ considerably in sugar content. The size and the vigor of the tree were found the dominant factors influencing sap flow. An examination of sap yields from various kinds of maple showed the red and silver species to produce less than two-thirds as much sap as do sugar maples.

On attaching pressure gauges to well-developed vigorous trees, the readings showed no direct correlation between pressure and sap flow nor between pressure and temperature, although it was apparent at times that increased pressure contributed to increased flow. Sap pressure was uniformly higher in the sugar than in the soft maples.

Data are also presented on the costs of production, returns in relation to size of the bush, the type of equipment, the sugar content of the sap, etc.

Northern white pine in the southern Appalachians, J. A. Cope (*Jour. Forestry, 30 (1932), No. 7, pp. 821–828*).—Stating that the original distribution of white pine in the southern Appalachian area has been greatly reduced by lumbering, fire, and insects, the author points out that the excellent growth rate of white pine both in natural stands and in plantations suggests that the species should have an important place in southern mountain forestry. Blister rust and weevil, the two most serious enemies of white pine in its northern range, are said to constitute no serious obstacle in the southern area.

The effect of the concentration of the culture solution on seedlings of ponderosa pine, J. Howell, jr. (*Jour. Forestry, 30 (1932), No. 7, pp. 829, 830*).—

Using various concentrations of the California culture solution, it was found that the longest roots developed in the more dilute cultures and the shortest in the more concentrated solutions. Dilute solutions tended to produce extensive root systems with many laterals, a type of growth explained on the basis that under conditions of limited nutrition the plant must put forth greater efforts to secure adequate nutrients.

Relation of western yellow pine seedlings to the reaction of the culture solution, J. Howell, jr. (*Plant Physiol., 7 (1932), No. 4, pp. 657–671, figs. 7*).—Using water cultures, it was found in these studies at the University of California that western yellow pine seedlings prefer an acid medium for their best growth, even greater than that preferred by most cultivated plants. The growth limit on the acid side was at pH 2.7, while that on the alkaline side was not determined exactly but was in the vicinity of pH 11. The seedlings in the acid solutions were vigorous and thrifty, while those in the alkaline cultures were stunted and chlorotic. Taproots in the alkaline solution were brown and thickened, with a tendency to disintegrate.

The plants themselves were found to modify the soil reaction, apparently by excreting some organic substance. Calcium was not in itself harmful.

Effect of partial cutting in the virgin stand upon the growth and taper of western yellow pine, F. X. Schumacher (*California Sta. Bul. 540 (1932), pp. 32, figs. 12*).—Taking advantage of a moderately heavy selective cutting in 1910 in the Stanislaus National Forest followed by a second cutting in 1928 on the same area and in an adjacent virgin stand, studies were made of the form or taper of the virgin timber by the method of stem analysis and of the changes in form and growth following the opening of the virgin forest.

In general the periodic diameter growth at breast height between 1910 and 1928 was greater in the trees in the cut-over stand, but all tree classes in the cut-over area made less height growth after the 1910 logging, the accelerated diameter growth being apparently accompanied by a retarded height growth. Average diameter growth along the stem was practically independent of size of tree but was interdependent with height growth. In general the periodic diameter growth of the virgin stand decreased slightly from breast height to a point about one-fourth the way up and thereafter increased, whereas the diameter growth of the cut-over trees decreased slightly from breast height to the tip.

In conclusion the author states that the results of the comparison of trees in a virgin stand with those in a cut-over area were not sufficiently definite to warrant the assertion that partial logging is followed by an increase in the volume growth rate of the residual trees. The greater diameter growth of the residual cut-over trees was apparently offset by the greater height development of those in the virgin stand.

Quality versus size as an index of a profitable tree: Loblolly pine, B. H. Paul (*Jour. Forestry, 30 (1932), No. 7, pp. 831–833, fig. 1*).—Noting that trees as large as 16 or 17 in. in diameter at breast height are sometimes handled at a loss because of their inferior lumber and that trees as small as 10 or 11 in. often produced lumber of sufficient quality to offset the increased cost of manufacture, the author asserts that size alone is not a criterion of a profitable tree but that quality is of collateral importance.

Converting factors for some stacked cords, G. L. Schnur (*Jour. Forestry, 30 (1932), No. 7, pp. 814–820, figs. 2*).—In this study, conducted by the U. S. D. A. Forest Service in the beech-birch-maple type, the amount of solid wood per stack cord was found to be approximately the same for trees of all diameters when random piling was employed and all pieces over 8 in. in diameter were

split. The conclusion is reached that one converting factor may be used for diameter breast height classes, namely, 73 ± 5 cu. ft. of solid wood to the standard cord or 79 ± 6 cu. ft. to the chemical-wood cord.

DISEASES OF PLANTS

Portuguese glossary of mycology and phytopathology, E. Rangel (*Contribuição para o Glossario Portuguez referente á Mycologia e á Phytopathologia. Rio de Janeiro: Min. Agr., Inst. Biol. Defesa Agr., 1931, pp. 72*).—The main part of this collection consists of terms having significance in mycology or in phytopathology with Portuguese word or phrase equivalents or explanations. This is followed by a vocabulary of Latin or Latinized terms, each having its equivalence briefly indicated in Portuguese.

A host index to the North American species of the genus Cercospora, C. Lieneman (*Ann. Missouri Bot. Gard., 16 (1929), No. 1, pp. 1–52*).—This account presents in systematic form an introductory description of the genus Cercospora, with a history, a plan of nomenclature and citations, a host index, an index of 516 species of Cercospora, and other data.

A cytological study of heterothallism in Puccinia coronata, R. F. Allen (*Jour. Agr. Research* [*U. S.*], *45 (1932), No. 9, pp. 513–541, pls. 16*).—Studies are reported on the method of the entrance of *P. coronata* into the leaves of seedling buckthorn plants (*Rhamnus cathartica*) and the subsequent development of the mycelium and various reproductive organs of the fungus.

P. coronata was found to be heterothallic. The unisexual infection, if carefully isolated, produced spermatia but no aeciospores. Aecia were formed, but they remained sterile. When spermatia of opposite sex were transferred to the surface of an infected area, their nuclei entered the exposed tips of the receptive hyphae, initiating there the sporophytic generation. From these points the sporophyte was found to spread by the growth of diploid hyphae, probably also by nuclear divisions and migrations through ready-formed haploid hyphae. The aecium that is to form spores was found to contain both sporophytic and gametophytic hyphae from the start, or it may begin as a haploid, unisexual aecium and be invaded later by the sporophytic component.

Plant pathology (*Maine Sta. Bul. 360 (1931), pp. 195–206, figs. 3*).—Reports are given of the following studies: Potato Degeneration Diseases, by R. Bonde and D. Folsom of the station in cooperation with E. S. Schultz, W. P. Raleigh, and C. F. Clark of the U. S. Department of Agriculture, including studies of transmission by aphids and other insects; Rots of Potato Tubers and Seed Pieces, and Potato Spraying and Dusting, by Bonde; Potato Seed Treatment, by Schultz and Raleigh; Potato Scab, by Raleigh; Apple Scab Control, by Folsom; and Blueberry Diseases, by F. L. Markin, including effects of fungicides.

[Research in plant pathology] (*North Carolina Sta. Rpt. 1931, pp. 67–89, figs. 5*).—Progress reports are given of investigations by S. G. Lehman on cottonseed treatment, barley seed treatment, oat smut, wheat rosette and mosaic, watermelon wilt, tobacco mosaic, and a new tobacco root disease, the cause of which is not definitely known; and studies by R. F. Poole on the control of the bacterial spot of peaches and the nearly similar canker and spot caused by arsenate injury, cane blight disease of dewberries and the control of the causal organism, chemical control of wilt diseases caused by *Fusarium lycopersici* and *Bacterium solanacearum* and other organisms causing root rot, plant treatment for the control of the black shank disease of tobacco, treatment for the control of root rot of tobacco caused by *Thielavia basicola*, plant

treatment for the control of black rot of sweetpotatoes, effects of certain chemicals on *Ceratostomella fimbriatum* (the causal organism of the black rot disease of the sweetpotato), effects of certain chemicals on sweetpotatoes when used in various amounts, susceptibility of different sweetpotato varieties to the scurf disease, varietal resistance to root rot disease of sweetpotatoes, and soft rots and the causal organisms on late harvested sweetpotatoes.

Report of the mycologist, G. B. WALLACE (*Tanganyika Ter. Dept. Agr. Ann. Rpt. 1929–30, pt. 2, pp. 45–49*).—A blackening, drying, and shrinking coffee bean disease occurring near Moshi has been investigated since December, 1929, and the cause has been determined as *Nematospora coryli*, a fungus having a wide host range and using as carrier the coffee bug, *Antestia lineaticollis*.

Coffee cherry fall, though somewhat similar, appears to be a manifestation of physiological weakness in the trees, or of overbearing. Coffee blossom injury (discoloration and shrinkage) and premature fall appeared independent of any fungus parasite.

Recently observed fungi parasitic on coffee include *Phomopsis* sp. on the twigs, *Cercospora coffeicola* followed by *Leptosphaeria coffeicola* on the leaves, and *Leptosphaeria* sp., supposedly a new species, on the twigs of Arabian coffee, all supposedly of little importance at present.

Grevillea robusta trees, grown for shade in a northern coffee plantation, were found to be heavily attacked by *Armillaria* sp., the coffee trees appearing free from attack by the fungus, though a few were attacked by *Rhizoctonia bataticola*, which did not attack the Grevillea in this locality.

The sisal disease described as a water-logging in the previous report has been recently found also on very dry soils. Loss or absence of nitrates in the soil may favor the abnormality.

A canker and die-back affecting lemon trees more than lime trees has been observed in the Morogoro district. External gumming is not a symptom in this area. Apparently only a Physalospora (with its conidial form *Diplodia* sp.) is present.

In the Northern Province, roots of tangerine orange are found to bear *Cytospora* sp., and lemon to bear *Armillaria* sp. Sweet orange fruits are attacked by a fungus agreeing with *N. coryli*, the carrier being supposedly the bug *Leptoglossus zonatus*.

Miscellaneous diseases listed for the year include seed yeast spot of bonavist bean (*Dolichos lablab*) and of Lima bean (*Phaseolus lunatus*), supposedly transmitted by the green bug; and *Phyllosticta malkoffii* causing a cotton leaf spot with *Ascochyta* sp. as a later contamination.

Additional identifications reported as made during the year include on mulberry branches *Sphaeropsis heterospora*, besides a species later observed having spores more closely agreeing with those of *S. mori*; on Sansevieria, *Leptosphaeria* (n.?) sp.; on rice leaves and glumes, *P. glumarum*; on wheat, *Puccinia graminis*; on papaw, *Colletotrichum gloeosporioides*; on coconut, a fungus apparently of a new genus in the Tubercularіaceae; on *Washingtonia filifera*, *Diplodia epicocos*, and *Phyllosticta palmicola*; on rose, *Gloeosporium* sp.; and on *Hibiscus esculentus*, *C. hibisci* and *Libertella affinis*.

Eelworms (Heterodera schachtii Schm.) affecting cereals in South Australia, J. DAVIDSON (*Jour. Dept. Agr. So. Aust., 34 (1930), No. 4, pp. 378–385, figs. 5*).—Since October, 1928, the author has observed injurious nematode activity in connection with a stunting of wheat and oats at points in South Australia. These eventually proved to be referable to the form *H. schachtii*, which is said to occur also to some extent on barley in various districts of South Australia.

A tabulation is given covering partially the years 1922 and 1926 to 1930 by months, districts, and crops as to the incidence of this nematode, which is dealt with in some detail for purposes of control.

Eelworm and "no-growth" patches, A. R. HICKINBOTHAM (*Jour. Dept. Agr. So. Aust., 34 (1930), No. 4, pp. 386–392, figs. 6*).—Late in August, 1930, patches making little or no growth appeared in barley at the Roseworthy Agricultural College. The damage was associated, though not to the degree of complete consistency, with the presence of a nematode, believed to be *Heterodera schachtii*, also found in association with defective growth in other cereals. The results of varying or conflicting observations and experiences are indicated.

Grey speck disease of oats, D. W. DAVIES and E. T. JONES (*Welsh Jour. Agr., 7 (1931), pp. 349–358, pls. 4*).—The very characteristic symptoms are very briefly given of a disease affecting many varieties of oats, provisionally identified as halo blight, which has appeared annually since 1921 on areas of the Welsh Plant Breeding Station. These symptoms are said to agree very closely with those of a disease described in many countries by names the equivalent to gray speck, gray leaf, or dry speck. The present account deals mainly with the resistance of varieties, seed transmission, and control measures.

Of the eight varieties of oats studied as commonly grown locally, the forms listed as highly resistant were Radnorshire Sprig and Ceirch-du-bach; as resistant, Scotch Potato; as moderately susceptible, Victory, Record, Black Tartar, and Golden Rain II; and as very susceptible, Orion.

Manganese sulfate applied either before or after sowing gave complete control of gray speck and stimulated slightly the seedlings. No seed transmission of gray speck was obtained, though plants grown on an affected area showed marked reduction in yield and a lowering in percentage of well-filled grain.

Studies on the annual recurrence of "powdery mildews" of wheat and barley in India, I, K. C. MEHTA (*Agr. Jour. India, 25 (1930), No. 4, pp. 283–285, pl. 1*).—Of the powdery mildews (*Erysiphe graminis*), long known as serious pests of wheat, barley, oats, etc., in Europe and North America, Butler is here credited with having recorded incidence (E. S. R., 40, p. 47) only on wheat. The present author here records his own observations of this fungus also on barley, stating that during his investigations on cereal rusts in the Kumaon hills and near Simla he observed serious attacks of powdery mildew on both wheat and barley crops. The disease is very common also at the foot of the hills.

Conidia quickly lose their viability on the plains under the high temperature which prevails there. The perithecial material collected at harvest time from fields in the hills and at the foot of the hills have invariably proved to be sterile. The fungus lives on self-sown plants and tillers of wheat and barley in the hills during the summer. "The most evident factor of annual recurrence of powdery mildews seems to be the survival of the conidial stage up in the hills. Regular incidence of these pests on crops at the foot of the hills and their casual appearance on crops in the plains under moist conditions of weather and soil is probably due to wind-blown infection from the hills. Following a successful infection of the hill crops in October-November, the fungus grows rather slowly on account of the winter cold and after a comparatively long incubation appears in the conidial stage by December-January. How far the perithecia in the hills from the previous crop are responsible for fresh infection every season, it is not possible to say definitely at this stage. It is not unlikely that, on account of frequent showers of rain in the hills, most of the perithecia may bring about infection the same season in which they are produced."

"Take-all" and "no-growth" diseases of wheat and other cereals, S. D. GARRETT (*Jour. Dept. Agr. So. Aust., 34 (1930), No. 4, pp. 346, 347, fig. 1*).—During the winter of 1930 many specimens of wheat and other cereals affected with the so-called no-growth disease have been examined at the Waite Agricultural Research Institute. This term covers both the stunting and killing in the early growth stages. Take-all, as here used, means empty ears and dead or dying condition of the plants at the heading stage.

Some no-growth patches have been found to be due to *Heterodera schachtii* and others to different fungi, two of these of major importance being *Rhizoctonia* sp. and *Brachysporium* sp. The first named of these is said to have been the earliest recorded as causing a similar condition of wheat in South Australia by Samuel in 1928 (E. S. R., 65, p. 645). This organism is said also to have caused a similar disease of cereals in India, Italy, and the United States.

From the take-all patches has been isolated a fungus temporarily designated as Brachysporium, approximating closely to *Acrothecium lunatum*, which has been recorded on cereals in India, Ceylon, and the Gold Coast. This had not been isolated from no-growth patches previous to 1930. It may appear in patches or in singly diseased plants scattered through the crop, presumably by wind-borne spores.

A third fungus obtained from no-growth patches, though less frequently, is *Helminthosporium sativum*.

Relation of the semipermeable membranes of the wheat kernel to infection by Gibberella saubinetii, G. W. PUGH, H. JOHANN, and J. G. DICKSON (*Jour. Agr. Research [U. S.], 45 (1932), No. 10, pp. 609–626, figs. 8*).—A report is given of a study by the U. S. D. A. Bureau of Plant Industry and the Wisconsin Experiment Station of the development of the wheat kernel in relation to semipermeable membranes and their rôle in limiting infection by the wheat scab organism.

The authors report that the testa of the mature wheat kernel is derived from the inner integument of the ovule and is coextensive with it. It completely envelops the seed except at the micropyle and in the groove region, where it originates sharply at either side of the vascular trace of the groove. The outer layer of the testa is said to vary in thickness, the thickest portions being found in the groove, along the top of the kernel, and in the region extending from the micropyle to the base of the groove. It is thinnest over the embryo.

The testa was found to become increasingly resistant to penetration by *G. saubinetii* as the grain matures, the degree of resistance of the membranes being apparently proportional to their thickness. The outer membrane is the most resistant layer of the kernel. Kernels infected at flowering time may be permeated throughout by the fungus. In wheat grains infected at maturity the fungus is usually localized at the embryo end of the kernel; it is sparse in the testa, nucellar layer, and endosperm; the aleurone cells may be filled with hyphae for considerable distances along the groove, for a shorter distance on the dorsal side, and a considerably shorter distance on the flanks; and the embryo is more or less completely permeated by fungus hyphae.

The authors consider that the location and structure of the protective parts, especially the layers of the testa, and the distribution of water within the kernel appear to be important factors which influence the entrance and spread of *G. saubinetii* within the wheat kernel.

Alfalfa diseases in California, J. L. WEIMER and B. A. MADSON (*California Sta. Circ. 326 (1932), pp. 19, figs. 7*).—Descriptions are given of bacterial wilt (*Phytomonas insidiosa*); dwarf, the cause of which is not definitely known; rust (*Uromyces medicaginis*); leaf spot (*Pseudopeziza medicaginis*); yellow

leaf blotch (*Pyrenopeziza medicaginis*); downy mildew (*Peronospora trifoliorum*); bacterial blight (*Phytomonas medicaginis*); crown wart (*Urophlyctis alfalfae*); and cotton root rot (*Phymatotrichum omnivorum*). The latter fungus is not known to attack alfalfa in California. The effect produced on the host plants by the various organisms is reported, and means are suggested for the control of the various diseases so far as definite measures are known.

Transmission of carrot, parsley, and parsnip yellows by Cicadula divisa, H. H. P. Severin (*Hilgardia [California Sta.], 7 (1932), No. 3, pp. 163–179, figs. 7*).—An investigation is reported, which was undertaken to determine whether the disease of carrots, parsley, and parsnips was caused by the virus of aster and celery yellows. Successive inoculations were attempted from asters and celery naturally and experimentally infected with yellows to healthy carrots, parsley, and parsnips by means of *C. divisa*.

It was found that previously noninfective *C. divisa*, after feeding on varieties of carrots, parsley, and parsnips naturally infected with yellows, became infective and transmitted typical yellows to healthy asters and celery. Previously noninfective leafhoppers, after feeding on the experimentally infected asters and celery, transmitted the disease back to the same varieties of carrots, parsley, and parsnip. These experiments are believed to prove that the virus of carrot, parsley, and parsnip yellows can be transmitted to asters and celery, and they demonstrate that the virus of carrot, parsley, and parsnip yellows is identical with that of California aster and celery yellows.

The average incubation period of the disease in small carrots was found to be 22.9 days and in large carrots 43.2 days, the large carrots apparently being more resistant to the disease. The incubation period of the disease in parsley varied with varieties. The average incubation period for parsnips was 40 days.

The leafhopper was found to complete its life cycle on all varieties of carrots except Yellow Belgian, and a low population of leafhoppers was obtained on most varieties of carrots. The life cycle was also completed on some varieties of parsley and on parsnips, while it failed to complete its life cycle on other parsley varieties.

A study of two Septoria leaf spots of celery, L. C. Cochran (*Phytopathology, 22 (1932), No. 10, pp. 791–812, figs. 4; abs. in Michigan Sta. Quart. Bul., 15 (1932), No. 2, pp. 131, 132*).—Two leaf spots of celery caused by species of Septoria are described. The leaf spot caused by *S. apii-graveolentis* is characterized by small leaf lesions, crowded black fruiting spots in the center of the spot and in the bordering green leaf tissue. This fungus was found to flourish during the fall when moisture is abundant and the temperature is between 60 and 65° F. The other leaf spot is characterized by larger spots surrounded by a reddish-brown border, with the small fruiting bodies occurring only in the central portions of the spots. The large spot Septoria was found only on leaves and was most abundant on summer celery. The small leaf spot is said to be most common is Michigan and probably throughout the United States, whereas the large leaf spot is believed to be the common form in Europe.

"Michigan Golden," a new celery resistant to yellows, R. Nelson and L. C. Cochran (*Michigan Sta. Quart. Bul., 15 (1932), No. 2, pp. 102–106, figs. 2*).—A description is given of a variety of yellows-resistant celery developed by the station through selection from Golden Self-blanching.

The use of formaldehyde dust in growing celery seedlings, J. D. Wilson (*Ohio Sta. Bimo. Bul. 159 (1932), pp. 198–204, figs. 4*).—For the control of damping-off, root rot, and nematodes on celery seedlings, the author recommends the treatment of the soil with formaldehyde dust. The dust may be mixed with the soil and the mixture placed in the bed, or the bed may be prepared and the dust spread on the top of the soil and quickly worked in

to a depth of from 3 to 4 in. It was found that celery seedlings could not be safely transplanted into muck soil treated with formaldehyde dust until a period of 48 hours after the treatment had elapsed, and a period of 72 hours was found to be still better. The necessity for this interval to permit the escape of the formaldehyde was found to be even more imperative in the case of mineral soils. In treating celery seed beds, 12 oz. of a 6 per cent formaldehyde dust is recommended for each bushel or 1.5 cu. ft. of soil.

If nematodes are suspected of being present in the soil, it should be screened to remove all large roots, etc., and then treated with the dust at the rate of 16 oz. per bushel.

A bacterial stalk rot of maize, H. H. PRASAD (*Agr. Jour. India, 25 (1930), No. 1, p. 72, pls. 2*).—In August, 1928, at Pusa, a rotting, putrid condition was noticed to occur on well-grown maize stalks a foot or more above the ground. A bacterial causation was suspected. This was confirmed in August of the next summer after the disease had again appeared in the village lands around Pusa, though apparently confined to the fertile sandy loam fields in contrast to the low-lying dhab lands. The progress of the disease is described. It is thought to be identical with that reported by Rosen (E. S. R., 55, p. 847) as bacterial stalk rot of maize in Arkansas, caused by *Phytomonas dissolvens*.

Studies on blackarm disease of cotton, [I], II, R. E. MASSEY (*Empire Cotton Growing Rev., 7 (1930), No. 3, pp. 185–195, figs. 2; 8 (1931), No. 3, pp. 187–212, pls. 4, fig. 1*).—Previous contributions on this subject have been noted (E. S. R., 65, p. 646).

In the first of the two present communications it is stated that the failure of seed disinfection to inhibit the development of cotton black arm disease had led to the search for other means of infection. It was found that *Bacterium malvacearum* survived in dry débris of the field for a relatively long period, this parasite being highly resistant to drought and heat while within plant débris. The survival of *B. malvacearum* in soil, apart from débris, for any length of time, is doubtful, though it survives in river water for some weeks.

Though the existence of a filter-passing stage has been proved, it is not yet known whether this form occurs naturally.

From a study of the relation of boll infection to infection of the contained seed, the main conclusion reached is that clean bolls produce clean seed and that severe infections are required to allow the parasite to invade the seed interior. It is believed that the reappearance of the disease in areas in which clean seed had been sown is attributable largely to the season-to-season carrying over of the infection.

In the second communication it is emphasized that the appearance to a dangerous extent of cotton black arm is due to a combination of factors of which high soil moisture and low temperature are prominent. Though the disease is carried chiefly outside the seed coat, internal infection is known to occur. The amount of splitting of the seed coats and penetration by the parasite is decisive, though modified as to effectiveness by development in time of lethal influence in the soil. No other method of air-borne infection is known. Watering may minimize the danger of infection from infected débris. *B. malvacearum* in wet soil does not live longer than 72 hours. The practical significance of the presence of the bacteriophage found in the soil of the Gezira is still in need of investigation.

The principles underlying the methods of control in the field have been summarized.

Studies on toxic action.—II, The toxicity of normal aliphatic alcohols towards potato tuber, W. STILES and M. L. L. STIRK (*Protoplasma, 13 (1931)*),

No. 1, pp. 1–20, figs. 4).—"This paper is intended to be the first of a number of contributions to our knowledge of the relationship between chemical constitution and toxicity." The toxicity of eight normal aliphatic alcohols toward potato tuber tissue was compared by following the rate of exosmosis of electrolytes into solutions of each of the alcohols of various concentrations. Solutions are regarded as equitoxic when they bring about equal exosmosis under like conditions. With each increase of one carbon atom in the carbon chain the toxicity of the alcohol is increased from 2.25 to about 4.7 times, so that normal octyl alcohol appears to be more than 2,000 times as toxic as methyl alcohol.

Why potatoes run out, D. Folsom (*Abs. in Maine Sta. Bul. 360 (1931), pp. 221, 222*).—Potatoes are said to degenerate because of diseases of the mosaic streak, leaf roll, and spindle tuber types. The potato variety Green Mountain is reported to carry a type of mosaic that can be disclosed only by transferring juice to tobacco, Jimson weed, or other varieties of potatoes. The yield of Green Mountain potatoes was found to be appreciably reduced by mild mosaic, rugose mosaic, spindle tuber, and leaf roll. Streak is said to produce no mottling in Green Mountain potatoes, but when transferred to Spaulding Rose it produces mosaic. While its effects are severe, streak is said to not persist in the variety Green Mountain when grown in Aroostook County.

It is claimed that the roguing of tuber unit seed plats offers the best method of control under Maine conditions.

[Effect of various lime treatments on potato scab], J. A. Chucka and D. B. Lovejoy (*Maine Sta. Bul. 360 (1931), pp. 179, 180*).—Some results are given of a study of the use of lime in clover and potato rotations.

The toxicity of certain sulphur compounds to Synchytrium endobioticum, the fungus causing wart disease of potatoes, W. A. Roach and M. D. Glynne (*Ann. Appl. Biol., 15 (1928), No. 2, pp. 168–190, figs. 8*).—Earlier experimentation (E. S. R., 55, p. 653) has shown that the toxic action of sulfur on winter sporangia of *S. endobioticum* in soil shows considerable differences under different conditions both of season and of soil type.

In the present work, the toxicities toward the winter sporangia of *S. endobioticum* of certain of the simpler sulfur compounds likely to be formed when sulfur is added to the soil were tested and compared with the toxicity of sulfuric acid. It was found that sulfuric, sulfurous, dithionic, trithionic, tetrathionic, and pentathionic acids were toxic, and that this toxicity was of the same order in each case at the same H-ion concentration. Their neutral salts were nontoxic. These facts suggest that the toxicities of these acids are due mainly to the H-ion concentrations.

Acidified solutions of sodium thiosulfate, sodium hydrosulfite, and sodium formaldehyde sulfoxylate were about 10 times as toxic as sulfuric acid. Evidence is presented suggesting that the toxicity of these acidified solutions, in excess of that ascribed to H-ion concentration, is due to the thiosulfuric acid present in each case, though in view of the experimental difficulties and length of time taken, this conclusion should be regarded as tentative.

Of the other compounds tested sodium hydroxide was slightly more toxic than sulfuric acid, and persulfuric acid about 10 times as toxic; hydrogen peroxide, calcium polysulfide, and sulfureted hydrogen were only slightly toxic.

Sulphur as a soil fungicide against the potato wart disease organism, W. A. Roach (*Jour. Agr. Sci. [England], 20 (1930), No. 1, pp. 74–96, figs. 8*).—The variability in the toxicity of sulfur when used against potato wart disease (*Synchytrium endobioticum*) has been investigated earlier, as have also the underlying causes. The acidity resulting from the formation of sulfuric acid having been found insufficient to account for the fungicidal action, search was

instituted for some other compound (presumably developing from sulfur and soil). This search proceeded along two lines, namely, the exploration of the chemical changes undergone by sulfur in soil, and the determination of the toxicities of compounds formed or likely to be formed under the conditions. The first investigation proved to be much the more difficult of the two. Work on the second phase of the investigation is noted above.

In this work, thiosulfuric acid has been shown to exist in a free state. This is relatively stable in dilute solution, as an M/200 solution is found to be only half decomposed at the end of 1 day and an M/400 solution at the end of 10 days. Such degree of stability is considered sufficient to account for the fungicidal action of acidified thiosulfate solutions in terms of the liberated thiosulfuric acid. It is claimed to be necessary to assume only 6 per cent of the minimum quantity of sulfur found effective against wart disease in the field to be in the form of thiosulfuric acid over a period of 10 days in order to account for its toxicity.

Experiments preliminary in character carried out on sulfur-treated soil showed that pentathionate was formed in Rothamsted soil kept at 30° C., but not in Ormskirk soil kept at that temperature, nor in either soil at 0 or 15°.

While no definite evidence as to the accumulation of appreciable quantities of thiosulfuric acid in the soil was obtained, reasons are given for thinking that this negative evidence is not final. It is suggested from chemical considerations and the work of others indicate that the pentathionate actually identified in the soil solution arose from thiosulfuric acid formed in an early stage of the oxidation of the sulfur. It is held that the explanation of the fungicidal action of sulfur toward wart disease in soil in terms of the formation of thiosulfuric acid is alone in harmony with the ascertained facts.

Tomato diseases in South Australia and how to control them, with special reference to glasshouse tomato culture, G. Samuel (*Jour. Dept. Agr. So. Aust., 34 (1930), Nos. 2, pp. 154–166; 3, pp. 253–272, figs. 13; 4, pp. 369–377, figs. 7; 5, pp. 499–510, figs. 12; 34 (1931), No. 6, pp. 621–633, figs. 3*).—In general, the first of these sections deals with the growing of healthy plants; the second with the nature and kinds of diseases, attacks, and other disturbances to which tomato plants are subject, with their causes, as viruses, bacteria, fungi, animals, including nematodes, and nonparasitic occasions of loss, depending partly upon other adverse conditions; the third and fourth with various distinct diseases, mostly well known; and the fifth with animal pests (insects and nematodes) and killing applications for protection from the foregoing.

Control of fire blight by treatment of cankers, R. C. Thomas (*Ohio Sta. Bimo. Bul. 159 (1932), pp. 195–197, figs. 3*).—The zinc chloride treatment of fire blight cankers is recommended, and directions are given for its proper use.

Silver leaf, E. Leishman (*Jour. Dept. Agr. So. Aust., 34 (1931), No. 10, pp. 1016, 1017, fig. 1*).—Though attention was drawn for several years to a silvering of the leaves of the plum and to a lesser extent of the cherry and apple trees, only in 1930 or 1931 was definite proof obtained that the cause was the bracket fungus, *Stereum purpureum*. Symptoms and control are outlined.

Court-noué [trans. title], L. Ravaz (*Prog. Agr. et Vitic. (Éd. l'Est-Centre), 51 (1930), No. 39, pp. 293–297, figs. 3*).—It is claimed that court-noué and chlorosis are contagious, and the grape variety Rupestris is very susceptible, Riparia more resistant. Results of treatments are briefly indicated.

Recent studies on mal-nero and court-noué [trans. title], L. Rives (*Prog. Agr. et Vitic. (Éd. l'Est-Centre), 50 (1929), Nos. 43, pp. 395–399; 44, pp. 424–426; 45, pp. 448–454*).—Grape varieties involved, with information as to disease effects and control measures, are briefly dealt with.

Notes on blueberry diseases in Maine, F. L. Markin (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 15 (1931), No. 2, pp. 11–14; abs. in Maine Sta. Bul. 360 (1931), pp. 219, 220*).—The occurrence of various diseases of blueberries in Maine is reported.

Mal secco disease of citrus proves serious in Sicily, H. S. Fawcett (*Citrus Leaves, 11 (1931), No. 5, p. 4, fig. 1*).—Mal secco, a disease of lemon, citron, and sour orange trees, is caused by *Deuterophoma tracheiphila*, and is characterized in its early stages by a quick wilting of the leaves and rapid drying out of the twigs, followed by death of the larger branches and finally of the trunk. The disease is said still to be confined to the region of Sicilia (Sicily), Greece, and Palestine. The organism is believed to have been present in Greece for a long time before invading Sicilia, where it first appeared near Messina, spreading slowly in about 10 years to the vicinity of Catania.

Control of scaly bark of orange at Chaffey, H. R. Stanford (*Citrus Leaves, 11 (1931), No. 1, pp. 8, 9, 18–21*).—From work directed during six years against orange psorosis at the orange grove of the Chaffey Junior College at Ontario, Calif., it is stated that the scraping is the most important and necessary part of the treatment. This should be carried well into the healthy bark. The best applications for the scraped surfaces are sulfur compounds or carbolineum. Early attention is necessary on account of lag and imperfection in recovery after delay in treatment.

Gumming of almond trees, G. Quinn (*Jour. Dept. Agr. So. Aust., 35 (1931), No. 2, pp. 225, 226*).—It is stated that two forms of gumming are to be found on almond trees. Both of these are briefly described in connection with statements as to the corresponding causes, one a fungus (*Clasterosporium* sp.) and the other not technically designated but of animal origin.

Diseases of ornamental plants, P. E. Tilford (*Ohio Sta. Bul. 511 (1932), pp. 82, figs. 34*).—After a general discussion of disease and control measures, popular descriptions are given of the more common diseases of greenhouse and garden ornamental plants. Specific directions are given for the control of most of the diseases. Citations of the most important literature are added to the accounts given of many of the diseases.

Sporotrichum narcissi sp. n. parasitic on narcissus bulbs, Y. Tochinai and S. Shimada (*Sapporo Nat. Hist. Soc. Trans., 11 (1930), No. 3, pp. 121–128, fig. 1*).—In 1930 in Tokyo, backward narcissus (*Narcissus pseudonarcissus*), also a sickly crocus, showed the presence of an injurious fungus. Laboratory examinations showed two fungi to be present. One of these was considered to be identical with *S. radicicolum*. The other proved to be new, and is herein described under the name of *S. narcissi*.

Further investigations on the eelworm disease of phloxes, G. F. Wilson (*Jour. Roy. Hort. Soc., 55 (1930), No. 1, pp. 88–100, pls. 8, fig. 1*).—The work indicated in the preliminary paper recently noted (E. S. R., 53, p. 49) on this phlox disease has been continued and developed along several lines, with attempts to clear up the somewhat intricate phases of the life history of the stem nematode, *Tylenchus dipsaci* (*T. devastatrix*).

The parasitism of Conopholis americana on Quercus borealis, W. C. Percival (*Amer. Jour. Bot., 18 (1931), No. 10, pp. 817–837, pls. 4*).—The object of the present study was to determine the nature and results of the connection between *C. americana* and its one host (*Q. borealis*) in central New York. Associated species, as *Q. alba*, *Fagus grandifolia*, *Acer saccharum*, *A. rubrum*, and *Tsuga canadensis*, were free from the attack, even when their roots were contiguous to the affected parts of the red oak. The distribution of *C. americana* is restricted principally by the coincident occurrence of the red oak and a deep moist soil.

The present study favors the assumption that the seeds of *C. americana* germinate only in proximity to the root tips of the host and only when active growth is in progress.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Biographical memoir of Stephen Alfred Forbes, 1844–1930, L. O. Howard (*Natl. Acad. Sci., Biogr. Mem., 15 (1932), No. 1, pp. 54, pl. 1*).—Following this memoir is a bibliography of the entomological and other writings of S. A. Forbes, compiled by H. C. Oesterling (pp. 26–54), arranged in chronological order.

The birds of Chile, C. E. Hellmayr (*Field Mus. Nat. Hist. [Chicago] Pub., Zool. Ser., 19 (1932), pp. 472*).—Following an introduction, the author presents a historical sketch of Chilean ornithology (pp. 6–12), accounts of the expedition of the Field Museum (pp. 12–18), the general physiography of Chile (pp. 18, 19), climatic conditions, rainfall, and distribution of forests (pp. 19–21), life zones of Chile (pp. 21–23), geographical variation in Chilean birds (pp. 23–25), and bird migration in Chile (pp. 25, 26). A distributional list of the birds of Chile is then presented (pp. 26–428), followed by an ornithological bibliography of Chile (pp. 429–458) and an index (pp. 459–472).

[Contributions on economic entomology] (*Conn. Pomol. Soc. Proc., 38 (1928), pp. 28–30, 49–54, 102–105; 39 (1929), pp. 34–38, 39–44, 45–54, 79, 80, 91–104, 106–110; 40 (1930), pp. 19–22, 36–41, 42–66, 105, 106, 180–182; 41 (1931), pp. 21–25, 38–40, 42–48, 62–64, 68–72*).—The contributions here presented relating to economic entomology include the following:

1928.—Report on Important Insect Pests of the Past Season, by W. E. Britton (pp. 28–30); Tests for Oil Sprays, by N. Turner (pp. 49, 50); and The Use of Oil Sprays (pp. 50–54) and The Oriental Peach Moth Situation (pp. 102–105), both by P. Garman.

1929.—Report of Committee on Injurious Insects, by W. E. Britton (pp. 34–38); Parasites for the Oriental Peach Moth, by P. Garman (pp. 39–43); Report on Peach Moth Control Fund, by W. H. Darrow (pp. 43, 44); Recent Developments in Oriental Fruit Moth Control, by L. A. Stearns (pp. 45–54); The Place of Oil Sprays in Connecticut Orchards, by N. Turner (pp. 79, 80); Experiments with Modified Lime-Sulfur Sprays, by A. Kelsall (pp. 91–104); and Observations on the Use of Iron Sulphate in Connecticut Orchards, by M. P. Zappe (pp. 106–110).

1930.—Report of Committee on Injurious Insects, by W. E. Britton (pp. 19–22); Comparative Tests of Several Orchard Sprays, by E. M. Stoddard and M. P. Zappe (pp. 36–41); Oriental Peach Moth Control by Parasites and Insecticides in 1930, by P. Garman (pp. 42–46); Control of the Plum Curculio in Apple Orchards, by W. D. Whitcomb (pp. 46–53); Developments in Orchard Spray Materials and Spray Equipment, by W. S. Hough (pp. 54–58); "Bees as a Factor in Fruit Production," by G. H. Rea (pp. 58–66); The Use of Summer Oil Sprays in Connecticut, by N. Turner (pp. 105, 106); and Effect of the Apple Maggot on the Export Business, by M. J. Gray (pp. 180–182).

1931.—Control of [Plum] Curculio and "Sideworms," by M. P. Zappe (pp. 21–25); How Should the Grower Expect to Control Apple Leaf Hopper [*Typhlocyba pomaria*]? by P. Garman (pp. 38–40); Results of Apple Maggot Control Work in the Hudson River Valley, by P. J. Chapman (pp. 42–48); Report of Committee on Injurious Insects, by W. E. Britton (pp. 62–64); and Progress Report—Control of the Oriental Peach Moth in 1931, by P. Garman (pp. 68–72).

[Contributions on economic entomology] (*Ill. State Acad. Sci. Trans., 24 (1931), No. 2, pp. 156–164, 167–202, 226, 227, fig. 1, pp. 228–234, 235–240, figs. 5*).—The contributions presented at the annual meeting held in May, 1931, relating to economic entomology are as follows: Carnivorous Moths and Butterflies, by W. V. Balduf (pp. 156–164); Use of Temperature Accumulations as an Index to the Time of Appearance of Certain Insect Pests during the Season, by P. A. Glenn (pp. 167–180); Present Status of the Classification of Immature Insects, by W. P. Hayes (pp. 181–202); Statistical Analysis of Quantitative Collections as a Means of Interpreting Life Histories, by H. J. Van Cleave (pp. 228–234); and Grape Colaspis as a Corn Pest in Illinois, by J. H. Bigger (pp. 235–240).

[Contributions on economic entomology in Indiana for 1931] (*Ind. Hort. Soc. Trans., 1931, pp. 16–21, 72–76*).—The contributions presented at meetings held in July, 1931, and January, 1932, include the following: The Codling Moth Problem, with Reference to Use of Summer Oil Sprays (pp. 16–21), and Bands and Codling Moths (pp. 72–76), both by J. J. Davis.

[Report of work in entomology] (*Maine Sta. Bul. 360 (1931), pp. 189–193, fig. 1*).—Notes are presented on the work of the year with blueberry insects, by C. R. Phipps (E. S. R., 65, p. 756); blueberry pollination, by Phipps, F. B. Chandler, and I. C. Mason; cutworms, by Phipps and J. H. Hawkins; wireworms, by Hawkins; apple fruit fly or railroad worm, which includes dispersal (E. S. R., 67, p. 716), life history, and control studies, by Phipps; and insects in relation to virus diseases of potatoes, by G. W. Simpson and D. Folsom.

Research in zoology and entomology, Z. P. Metcalf (*North Carolina Sta. Rpt. 1931, pp. 106–112*).—The work under way referred to (E. S. R., 65, p. 153) includes the biology of the Homoptera, by Metcalf; the corn ear worm, by B. B. Fulton; wintering bees and a survey of the honey-producing plants of the State, both by F. B. Meacham; the bees of North Carolina and the taxonomy and biology of the leaf-cutter bees, both by T. B. Mitchell; the Harlequin bug, by Fulton; the genetics of Habrobracon, by C. H. Bostian; and a report on the biology of the cotton aphid, by H. R. Johnston.

[Report of work in entomology] (*Pennsylvania Sta. Bul. 279 (1932), p. 16*).—Brief notes are presented on work with springtails affecting mushrooms (E. S. R., 66, p. 756), by C. A. Thomas, and the oriental fruit moth, by S. W. Frost.

[Contributions on economic insects in Utah] (*Utah Acad. Sci. Proc., 9 (1931–1932), pp. 67–70; 79–83; 85–101, figs. 31; pp. 103–115*).—The following contributions (E. S. R., 67, p. 425) are presented: The Tarnished Plant Bug, *Lygus pratensis* (Linn.) and the Superb Plant Bug, *Adelphocoris superbus* (Uhler), in Relation to Flower Drop in Alfalfa, by C. J. Sorenson (pp. 67–70), Notes on Injurious Utah Insects, 1931, by G. F. Knowlton (pp. 79–83), Notes on Utah Trypetidae (Diptera), by M. J. Janes and W. L. Thomas (pp. 103, 104), The 1931 Grasshopper Outbreak in Utah, by G. F. Knowlton and M. J. Janes (pp. 105–108), Some Utah Aphids, by G. F. Knowlton (pp. 109, 110), and Notes on Insects in the Vicinity of Snowville, Utah, by G. F. Knowlton and L. Cutler (pp. 111, 112), all from the Utah Experiment Station; and The Paper Wasps of Utah, Including a Description of a New Variety of *Polistes canadensis* Linn., by C. L. Hayward (pp. 85–101), from the Brigham Young University.

In observations of the plant bugs, Sorenson found that 75.8 and 75.5 per cent of the alfalfa flowers dropped off without forming seed pods during the 4-year period 1926 to 1929, inclusive, and during the summer season of 1931, respectively. In experimental field tests the two plant bugs were found to be responsible for flower drop in alfalfa, the amount varying with the degree of

infestation and the length of the time of exposure. "These experimental data, together with the fact of the occurrence in the alfalfa fields of the tarnished plant bug (usually in excessive numbers) and of the superb plant bug (in considerable numbers) indicate that these two plant bugs at the present time constitute one of the environmental factors responsible for the flower drop of alfalfa which occurs in the open field. It is likely that there are other and perhaps more important causative factors entering into this problem than that of plant bug infestation."

[Report on sugarcane and other insects in Hawaii in 1931], O. H. SWEZEY and C. E. PEMBERTON (*Hawaii. Sugar Planters' Assoc., Rpt. Expt. Sta. Com. 1931, pp. 19–32, figs. 3*).—Accounts are given of the occurrence of and work with sugarcane insects and their control and some other insects in Hawaii.

Records of immigrant and recently introduced insects on Kauai, O. H. SWEZEY (*Hawaii. Ent. Soc. Proc., 7 (1929), No. 2, pp. 271–273*).—A brief record of observations of introduced insects on Kauai.

Preliminary notes on pests of agricultural crops of Kona, March 15, 1928, J. F. ILLINGWORTH (*Hawaii. Ent. Soc. Proc., 7 (1929), No. 2, pp. 248–254*).—Notes are given on the enemies of important vegetable and field and fruit crops of Kona, island of Hawaii.

Notes on agricultural and forest entomology in Morocco [trans. title], J. DE LÉPINEY and J. M. MIMEUR (*Mém. Soc. Sci. Nat. Maroc, No. 31 (1932), pp. [3]+195*).—Following a brief introduction, part 1 deals with the insect and other invertebrate enemies of agriculture and forestry in Morocco (pp. 5–130), and part 2 consists of a host list of such pests (pp. 131–156). Indexes to the animal pests (pp. 157–175) and the plants and materials attacked (pp. 177–192) are included.

Report of the chief entomologist for the year ended 31st December, 1931, J. K. CHORLEY (*Rhodesia Agr. Jour., 29 (1932), No. 7, pp. 522–538*).—Following a brief account of the insect enemies of agricultural crops in Rhodesia, a more extended account is given of those affecting the health of man and domestic animals.

Observations on insects attacking the farm crops, May–September, 1930, H. C. F. NEWTON (*Rothamsted Expt. Sta., Harpenden, Rpt. 1930, pp. 63–65*).—A brief account is given of some of the more important insects at Rothamsted in the summer of 1930.

Status of sugar cane pests in Hawaii in the year 1927, O. H. SWEZEY (*Hawaii. Ent. Soc. Proc., 7 (1929), No. 2, pp. 269, 270*).—A brief note on the important sugarcane pests in Hawaii and their enemies.

Insect infestation of stored cacao: A summary of recent information, J. C. HUTSON (*Trop. Agr. [Ceylon], 78 (1932), No. 5, pp. 312–316*).—It is pointed out that the most important insects associated with cacao beans in various cacao-producing countries are, in the order of their importance under Ceylon conditions, the cacao moth (*Ephestia elutella*), the rice moth (*Corcyra cephalonica*), and the coffee bean weevil.

Handbook of citrus insect control for 1932, R. S. WOGLUM ET AL. (*Calif. Fruit Growers Exch., Los Angeles, Bul. 9 (1932), pp. [1]+25*).—This handbook, which is in continuation of those of earlier years (E. S. R., 66, p. 757), includes a State classification (June, 1932) of oil sprays for use on citrus trees, presented in tabular form.

Biology and control of citrus insects and mites, H. J. QUAYLE (*California Sta. Bul. 542 (1932), pp. 87, figs. 42*).—A summary of information is presented on the biology and control of citrus insects and mites, aimed to replace in part earlier bulletins and to bring this subject up to date. A key to the common

citrus insects and mites is first presented, followed, in order, by accounts of economic pests of citrus.

Pests of pineapple in Hawaii, J. F. Illingworth (*Hawaii. Ent. Soc. Proc., 7 (1929), No. 2, pp. 254–256*).—Insects affecting the root system and the fruit, stem, and leaves of pineapples in Hawaii are briefly noted.

Some insect pests of tea in Ceylon, J. C. Hutson (*Trop. Agr. [Ceylon], 78 (1932), Nos. 4, pp. 189–210, pls. 4; 5, pp. 255–286, pls. 4; 6, pp. 327–336, pl. 1; 79 (1932), Nos. 1, pp. 3–18, pl. 1; 2, pp. 75–85, pl. 1; 3, pp. 137–148, pls. 2, fig. 1*).—A description is given of the important pests of tea in Ceylon, including the fringed nettle grub *Natada nararia* Moore, blue-striped or green-striped nettle grub *Parasa lepida* Cram the small gelatin grub *N. conspersa* Walk., saddle-backed nettle grub *Thosea cervina* Moore, Morawak Korale nettle grub *T. recta* Hmpsn., green nettle grub *T. cana* Walk., red-banded limacodid *Spatulicraspeda castaneiceps* Hmpsn., large nettle grub *Scopelodes venosa* Walk., lobster caterpillar *Stauropus alternus* Walk., the red slug caterpillar *Heterusia cingala* Moore, the tea tortrix *Homona coffearia* Nietn. and the red borer *Zeuzera coffeae* Nietn.

Narcissus pests, W. E. H. Hodson ([*Gt. Brit.*] *Min. Agr. and Fisheries Bul. 51 (1932), pp. VIII+40, pls. 5, figs. 2*).—This is a practical summary of information upon the bulb flies and the acarid and nematode enemies of narcissus.

Some observations on the insect faunas of native forest trees in the Olinda Forest on Maui, O. H. Swezey (*Hawaii. Ent. Soc. Proc., 7 (1931), No. 3, pp. 493–504*).—Following a note on the moth *Scotorythra paludicola* (Butl.), a list is given of other insects found on native forest trees, the arrangement being largely by host.

Further notes on the forest insects of Molokai, O. H. Swezey and E. H. Bryan, jr. (*Hawaii. Ent. Soc. Proc., 7 (1929), No. 2, pp. 293–314*).—A list is given of the insects collected in the mountains of east Molokai.

Notes on the egg-parasites of insects in Hawaii, O. H. Swezey (*Hawaii. Ent. Soc. Proc., 7 (1929), No. 2, pp. 282–292*).—A brief summary of the present knowledge of the insects in Hawaii which pass their immature stages within the eggs of other insects or otherwise destroy them. The list given includes the native species as well as those purposely introduced and natural immigrants.

The possibility of the entomological control of St. John's wort in Australia.—Progress report, G. A. Currie and S. Garthside (*Aust. Council Sci. and Indus. Research Pamphlet 29 (1932), pp. 28, figs. 3*).—Following a statement of the problem, the authors report on the insect fauna of St. Johnswort (*Hypericum perforatum augustifolium*) (pp. 11–15), a serious weed pest, based upon studies in England (pp. 15–20) and in Australia (pp. 20–24). Three beetles have passed all tests of their value in England and Australia, have been found effective and safe to introduce, and have been released in St. Johnswort areas, namely, *Chrysomela varians* Schall., *C. hyperici* Forst., and *C. brunsvicensis* Grav. (not *C. didymata*), as previously noted (E. S. R., 64, p. 549). The moths *Lathronympha hypericana* Hbn., *Eucestia* (*Anaitis*) *plagiata* L., and *E.* (*A.*) *efformata* Guen. have passed similar tests in England, and small trial shipments have been sent to Australia.

St. Johnswort, first introduced from Europe into Victoria about 1880, has spread over the surrounding hills of the town of Bright into the Dargo district and into New South Wales and become a pest of much concern.

Powdered skimmed milk is a good spreader for sprays, J. M. Ginsburg (*N. J. State Hort. Soc. News, 12 (1931), No. 2, p. 379*).—This is a contribution from the New Jersey Experiment Stations calling attention to the value of skimmed milk as a spreader for sprays.

Tests in the Rangoon River on the damage by marine borers to various woods, including Burma teak and British Guiana greenheart, creosoted and untreated, C. W. Scott (*Burma Forest Bul. 28 (1932), pp. 10, pl. 1*).—Tests at Rangoon of 20 different woods showed that the best for marine piling and fenders in Rangoon Harbor is creosoted kanyin (*Dipterocarpus* spp.).

Manson's eye-worm distributed by English sparrows, J. F. Illingworth (*Hawaii. Ent. Soc. Proc., 7 (1931), No. 3, p. 461*).—The author records having found that English sparrows in Hawaii are almost invariably infested with eye worms (*Filaria mansoni*), in one instance a half-grown bird examined having been found to contain 152 worms. It is thought that they act as an important distributor of the eye worm of poultry.

Quantitative biometric and host-parasite studies on Eimeria miyairii and Eimeria separata in rats, E. R. Becker, P. R. Hall, and A. Hager (*Iowa State Col. Jour. Sci., 6 (1932), No. 3, pp. 299–316, figs. 3*).—The studies relate to two distinct coccidial parasites of the rat found to be incapable of completing their life cycles in mice and ground squirrels.

Clover springtail (lucerne flea) (Smynthuris viridis) investigation, L. J. Newman and H. Womersley (*Jour. Dept. Agr. West. Aust., 2. ser., 9 (1932), No. 2, pp. 289, 290, fig. 1*).—A description is here given of *Biscirus lapidarius* (Kram.), a predatory mite of the family Bdellidae, which has been discovered to attack the clover springtail (*S. viridis*) and promises to be of considerable aid in controlling it.

Termites (white ants) in south-eastern Australia, G. F. Hill (*Aust. Council Sci. and Indus. Research Pamphlet 25 (1932), pp. 28, figs. 18*).—The author gives a simple method of identification of termites and a discussion of their damage in timber and forest trees.

Data on captures of the grasshopper Paratylotropidia beutenmuelleri Morse (Orthoptera: Acrididae), F. Sherman (*Ent. Soc. Wash. Proc., 34 (1932), No. 6, pp. 85, 86*).—A contribution from the South Carolina Experiment Station, in which the author reports the collection of *P. beutenmuelleri* from several localities in North and South Carolina.

Longhorned grasshopper, Conocephalus saltator (Saussure), as a pest of pineapples in Hawaii, J. F. Illingworth (*Hawaii Ent. Soc. Proc., 7 (1931), No. 3, pp. 407, 408*).—The author reports that *C. saltator* is a beneficial insect, since it feeds on many kinds of minute insects and has been observed to serve as a real check upon the pineapple mealybug. In fields that adjoin grass areas, however, it congregates in such numbers as to be a real menace, and apparently in the absence of sufficient insect food it attacks the plants.

The control of grasshoppers in Canada east of the Rocky Mountains, N. Criddle (*Canada Dept. Agr. Pamphlet 146, n. ser. (1932), pp. 8, figs. 2*).—A practical account.

The Palestine locust campaign, 1930, G. E. Bodkin (*Palestine Dept. Agr. and Forests, Agr. Leaflets, 1. ser., Anim. and Insect Pests No. 11 [1931], pp. 28, pl. 1*).—This account deals with the desert locust (*Schistocerca gregaria* Forsk.) in Palestine during the season 1929–30 and control measures applied.

Engytatus geniculatus Reuter—an important pest of tomatoes in Hawaii (Hem.), J. F. Illingworth (*Hawaii. Ent. Soc. Proc., 7 (1929), No. 2, pp. 247, 248*).—The mirid bug *E. geniculatus* is a source of injury to tomatoes in Hawaii through sucking the juice from the developing ovaries of tomatoes, causing the blossoms to drop prematurely.

Further studies of the genus Empoasca (Homoptera Cicadellidae).—Part I, Nine new species of Empoasca, D. M. De Long (*Ohio Jour. Sci., 32 (1932), No. 4, pp. 393–401, pl. 1*).—In this contribution, a continuation of the

previous work (E. S. R., 65, p. 54), nine species of minute leafhoppers of the genus Empoasca are described as new.

Leaf hoppers injurious to cereal and forage crops, H. Osborn (*U. S. Dept. Agr. Circ. 241 (1932), pp. 34, figs. 13*).—The first part of this account, following an introduction, considers the nature and extent of injury, crops affected, general habits of leafhoppers, hibernation, life history in general, relation to environment, natural enemies, and remedial measures. The more important species of leafhoppers affecting grain and forage crops are then considered (pp. 13–33), including the yellow-headed leafhopper, *Draeculacephala reticulata* Sign.; tenderfoot leafhopper, *D. mollipes* (Say); inimical leafhopper, *Deltocephalus inimicus* Say; black-faced leafhopper, *Thamnotettix nigrifrons* Forbes; striate leafhopper, *Deltocephalus striatus* L.; Say's leafhopper, *D. sayi* Fitch; destructive leafhopper, (*Euscelis*) *Exitianus obscurinervis* Stål; irrorate leafhopper, *Phlepsius irroratus* (Say); six-spotted leafhopper; potato leafhopper; and the clover leafhopper, *Agallia sanguinolenta* Prov.

A list is given of 29 references to the literature cited.

Movements of the beet leaf hopper in 1930 in southern Idaho, P. N. Annand, J. C. Chamberlin, C. F. Henderson, and H. A. Waters (*U. S. Dept. Agr. Circ. 244 (1932), pp. 24, figs. 11*).—Following an introduction, the subject is dealt with under the headings of the prediction for 1930 (pp. 4–7), flight in 1930 (pp. 7–22), and yields of sugar beets (pp. 22, 23).

Minutes and proceedings of the Froghopper Investigation Committee, XVIII–XX, S. M. Gilbert, E. J. Wortley, et al. (*Port-of-Spain, Trinidad: Govt., 1930, pts. 18, pp. 80, pls. 5; 19, pp. 81–192; 1931, pt. 20, pp. 193–268, pls. 4*).—The details of froghopper work as delivered at the meetings of the committee are here presented (E. S. R., 60, p. 650).

Minutes and proceedings of the Sugar Cane Investigation Committee, XXI, XXII, E. J. Wortley, S. M. Gilbert, et al. (*Port-of-Spain, Trinidid: Govt., 1931, pts. 21, pp. 269–331, pls. 3; 22, pp. 333–422*).—These accounts of froghopper work are in continuation of those noted above.

The melon aphid, Aphis gossypii Glover, C. C. Goff and A. N. Tissot (*Florida Sta. Bul. 252 (1932), pp. 23, figs. 14*).—Studies made of the life history and bionomics, natural enemies, and artificial control of the melon aphid, the most serious pest of watermelons in Florida and frequently injurious to vegetable crops, are presented.

In a study of the life history for the year ended May 20, 1931, a first-born and a last-born series of aphids were reared. "Of the first-born series 51 generations were born of which 47 completed their life cycle, and of the last-born series 17 generations were born of which 16 completed their life cycle. The average number of completed generations for the year was 31.5. The nymphal period varied from 3 to 20 days, with an average of 7.3 days; the reproductive period from 2 to 31 days, with an average of 15.6 days; and the post-reproductive period from 0 to 21 days, with an average of 5.3 days. The length of life varied from 9 to 64 days, with an average of 28.4 days, the aphids living longest during the coolest weather. The number of young born in one day varied from 1 to 14, the average number for the year being 4.3. All of the aphids were viviparous females which produce an average of 67 young each. The most favorable temperature for the aphids seems to be from 78 to 80° F. However, the aphids live and reproduce throughout the winter on both wild and cultivated hosts, migrating to the young melon vines as they come up. This migration is, of course, accomplished by the winged forms, which tend to develop in large numbers when the plants upon which the aphids are feeding become unfavorable as food."

Control was obtained through dusting infested plants with nicotine sulfate or with one of the liquid aphicides containing extracts of nicotine, pyrethrum, or derris.

Preliminary experiments with aphids as vectors of yellow dwarf, C. J. DRAKE, H. D. TATE, and H. M. HARRIS (*Iowa State Col. Jour. Sci., 6 (1932), No. 3, pp. 347–355, pl. 1, figs. 4*).—This contribution from the Iowa Experiment Station is in continuation of that previously noted (E. S. R., 67, p. 432), in which the authors demonstrated the ability of certain species of plant lice to transmit the causal agent of yellow dwarf of the onion from diseased to healthy plants.

In many attempts to transmit the disease with the bulb mite, greenhouse white fly, common red spider, onion thrips, springtails, leaf bugs, leafhoppers, onion maggots, and numerous other insects, negative results, except in a very few cases with the six-spotted leafhopper and in one instance with the mealybug found on greenhouse plants, were obtained.

The present paper deals only with experiments in the greenhouse, in which the bean aphid, apple grain aphid, green peach aphid, melon aphid, potato aphid *Macrosiphum gei* Koch, and the corn leaf aphid showed ability to serve as vectors of yellow dwarf.

Grasshoppers eat pineapple mealy bugs and other pests, J. F. ILLINGWORTH (*Hawaii. Ent. Soc. Proc., 7 (1929), No. 2, pp. 256, 257*).—A note on the long-horned grasshopper (*Conocephalus saltator* Sauss.).

A practical manual of lac cultivation, P. M. GLOVER (*Calcutta: Indian Lac Assoc. Research, 1931, pp. [3]+81, pls. 16*).—A practical manual of the lac insect, namely, the coccid *Laccifer lacca* (Kerr) which secretes the resinous encrustation known as lac, its biology, natural enemies and friends, host trees and their enemies, and methods of production. A list of 17 references to the literature is included.

The diaspine Coccidae of Japan.—VI, Genus Phenacaspis, I. KUWANA (*Japan Min. Agr. and Forestry, Dept. Agr., Sci. Bul. 2 (1931), pp. 1–14, pls. 3*).—This continuation of the author's studies (E. S. R., 60, p. 559) deals with the genus Phenacaspis, eight species of which have been recorded in Japan, four being described by the author as new.

The genus Kermes of Japan, I. KUWANA (*Japan Min. Agr. and Forestry, Dept. Agr., Sci. Bul. 2 (1931), pp. 15–29, pls. 8, figs. 5*).—The author recognizes five species of the coccid genus Kermes occurring in Japan, one of which is described as new to science.

Life history studies of some California Rhopalocera (Lepidoptera), K. R. COOLIDGE (*Amer. Ent. Soc. Trans., 50 (1924), No. 4, pp. 319–335*).—This contribution deals with the life histories of *Hylephila phylaeus* Drury, *Apodemia mormo virgulti* Behr, and *Callophrys dumetorum* Boisd., all occurring in southern California.

The potato tuber moth, R. H. PETTIT (*Michigan Sta. Quart. Bul., 15 (1932), No. 2, pp. 70–72, figs. 2*).—A brief account is given of the potato tuber worm, which was found infesting shipments of potatoes originating in Virginia.

The greasy cutworm (Agrotis ypsilon Rott.) in Egypt, I. BISHARA (*Egypt Min. Agr., Tech. and Sci. Serv. Bul. 114 (1932), pp. V+55, pls. 18*).—Following an introduction, the several parts of this contribution deal respectively with the occurrence of the black cutworm as a pest, relation to environment in the field, experimental study of relation between temperature and development, evidence as to succession of broods in Egypt, direct evidence of the migration of the black cutworm, natural control, and conclusion with regard to control measures. Tabular data are presented in an appendix. A colored plate illustrating the life stages of the pest is included.

An insect enemy of rice in Indochina (Spodoptera mauritia Boisd.) (Noctuidae) [trans. title], R. COMMUN (*Bul. Écon. Indochine, Sect. B, 35 (1932), Mar.–Apr., pp. 154–160, pl. 1*).—A description is given of the nut grass army worm, a noctuid of the subfamily Acronyctinae, and the injury it causes to young rice plants in the nursery in French Indochina. A list of 18 references to the literature is included, together with a colored plate illustrating the life stages of the pest.

On the biotic potential of the rice borer, Chilo simplex Butler, T. KABURAKI (*Imp. Acad.* [*Japan*], *Proc., 8 (1932), No. 6, pp. 264–266*).—The author here considers the reproduction of the Asiatic rice borer, one of the most destructive insect pests of the rice plant, which occurs in Japan proper, Nansei (Loochoo), Taiwan (Formosa), the Philippines, Java, Hawaii, Chosen (Korea), and some districts of the Asiatic Continent. "Assuming that the egg-laying capacity is on the average 300 eggs per female, and the sex ratio is 0.5, the annual biotic potential, starting with a single pair, is 300 in the one-brooded region, 90,000 in the two-brooded, and 8,100,000,000 in the four-brooded. Thus the biotic potential of the rice borer is extraordinarily high, according to regions."

A comparative study of the eggs of Californian anophelines, W. B. HERMS and F. M. FROST (*Jour. Parasitol., 18 (1932), No. 4, pp. 240–244, pls. 3*).—The authors have found the eggs of three species of California Anopheles to differ so markedly from one another that characters of their external anatomy may be used to differentiate the species.

The Anopheles of the Netherland East Indies, N. H. SWELLENGREBEL and E. RODENWALDT (*Die Anophelen von Niederländisch-Ostindien. Jena: Gustav Fischer, 1932, 3. ed., pp. VIII+242, pls. 24, figs. 68*).—In the first or general part of this work (pp. 1–52) the authors include tables for the identification of both sexes and of the larvae of the Netherland East Indies forms of Anopheles. The various species and varieties are dealt with in the special part which follows (pp. 53–224), the distribution of the more important being shown by use of maps. Plates which illustrate the structure of the adults and larvae of as many anopheline species and/or their varieties are included, as is an eight-page list of references to the literature.

A new biting Culicoides from saltmarshes in the Southeastern States, D. G. HALL (*Ent. Soc. Wash. Proc., 34 (1932), No. 6, pp. 88, 89, fig. 1*).—Under the name *C. dovei* the author describes a new species said to be one of the most important occurring along the southeastern Atlantic coast of the United States. Heretofore this species has been considered as *C. furens* Poey.

Description and notes on Mayetiola avenae March. (Diptera, Cecidomyidae) in Italy [trans. title], A. RICCHELLO (*Ann. R. Ist. Super. Agr. Portici, 3. ser., 4 (1931), pp. 1–70, figs. 25*).—This account has been noted from another source (E. S. R., 63, p. 851).

Warble flies and their control in Canada, E. HEARLE (*Canada Dept. Agr. Pamphlet 147, n. ser. (1932), pp. 11, figs. 4*).—A brief account is given of the common cattle grub and the northern cattle grub and means for their control in Canada. The two species are said to occur in every part of Canada where stock is raised, and have been noted occasionally in horses, buffalo, and goats.

Critical experiments with solid carbon disulphide capsules for the treatment of Gastrophilus spp. in the horse, J. BOZICEVICH and P. C. UNDERWOOD (*Vet. Med., 27 (1932), No. 8, pp. 360–364, fig. 1*).—This is a report of tests conducted upon seven horses with capsules each said to contain 6 fluid dr. of carbon disulfide adsorbed in magnesium carbonate, administered at the rate of one capsule or more per 1,000 lbs. of body weight. In the three animals found to harbor bots the treatment resulted in respective efficacies against bots of

94.4, 60, and 94.1 per cent. It was found that the efficacy of fresh solid carbon disulfide capsules for bots is inferior to that of liquid carbon disulfide.

A monographic study of the genus Geron Meigen as it occurs in the United States (Diptera: Bombyliidae), R. H. PAINTER (*Amer. Ent. Soc. Trans., 58 (1932), No. 2, pp. 139–167, pls. 2*).—This is a monographic account of bee flies of the genus Geron, contributed from the Kansas Experiment Station. The author identifies and describes 23 forms, of which 14 are new to science. The subgenus Empidigeron is erected.

The Bombyliidae of China and near-by regions, R. H. PAINTER (*Lingnan Sci. Jour., 11 (1932), No. 3, pp. 341–374, pls. 2, figs. 3*).—This contribution from the Kansas Experiment Station gives a key to the subfamilies and genera, followed by a catalogue of the Oriental Bombyliidae and a bibliography of four pages.

Mushroom maggots, E. I. MCDANIEL (*Michigan Sta. Quart. Bul., 15 (1932), No. 2, pp. 72–74*).—This is a brief practical account of the sciarids and phorids which infest mushrooms.

The buffalo fly (Lyperosia exigua De Meijere), M. HENRY and W. B. GURNEY (*Agr. Gaz. N. S. Wales, 43 (1932), No. 5, pp. 329–335, figs. 2*).—A practical summary of information on *L. exigua* in New South Wales.

Contribution to the knowledge of the Mediterranean fruit fly (Ceratitis capitata Wied.) (Diptera, Trypaneidae) [trans. title], G. COSTANTINO (*Ann. R. Ist. Super. Agr. Portici, 3. ser., 4 (1931), pp. 71–156, figs. 20*).—This is a report of a study of the morphology and biology of the Mediterranean fruit fly, presented in connection with an 11-page list of references to the literature.

The various types of molasses baits used in experiments in attracting the olive fly in Ascea, Salerno, in 1930 [trans. title], A. RICCHELLO (*Ann. R. Ist. Super. Agr. Portici, 3. ser., 4 (1931), pp. 283–301; abs. in Rev. Appl. Ent., 19 (1931), Ser. A, No. 9, p. 516*).—In experiments with poison baits used against the olive fly, in which a number of new formulas were tested, the commercial stock solution Dachicida F, containing 2 parts by weight of water, 2 of ammonium fluoride, and 100 of the normal stock bait mixture, consisting of 95 gal. of beet molasses, 25 lbs. of sodium arsenite, and from 2.5 to 3 gal. of water, gave the best results. This preparation used in a 10 per cent solution appeared to be about five times as attractive as a 10 per cent solution of the normal stock mixture.

Effective control of fruit fly by refrigeration: Report on cold storage tests for the control of fruit fly, 1929–30, F. W. PETTEY and E. A. GRIFFITHS ([*Union So. Africa Dept. Agr.*], *Sci. Bul. 99 (1931), pp. 9*).—In refrigeration control work, the details of which are presented in large part in tabular form, it was found that when infested fruit in trays, wrapped and packed for export, was stored for 3 weeks (in 1929) at a predominating maximum temperature of 32° F. all larvae and puparia were killed. The storing of infested fruit for a week at a predominating maximum temperature of 30° with a minimum range of 3° (1.5° above or below 30°) in 1929 killed all larvae and puparia, but this was not the case in more extensive tests of similar refrigeration in 1930.

Tests were made in 1930, using 1,400 peaches wrapped and packed for export, in 70 trays which were infested with 9,280 maggots and contained 47 puparia in the packing material. All stages of the fly were killed after exposure of this fruit for 21 days to a temperature of 32 to 32.5°. Exposure of 800 wrapped and packed peaches infested with 4,784 maggots containing 863 puparia in the packing material, for 1 week at 30° and afterwards for 2 weeks at 32°, resulted in perfect control. It was found, however, that exposure of wrapped and packed peaches for 1 week at a temperature of 30 to 30.5° would not kill

all the maggots. Eleven of the 113 maggots survived, and 2 of these developed to adults.

Experience has shown that table grapes will endure a storage temperature of 28°, pears a temperature of 29°, and some varieties of stone fruits a temperature of 31°. The results of the tests are considered to prove the practicability of killing all immature stages of the fruit fly by refrigeration of grapes, pears, and certain stone fruits that will endure the temperature, wrapped and packed for export, at approximately 32° for 3 weeks in a Government cold storage chamber or properly equipped ship's storage with a maximum range of 3° (1.5 below or above 32°).

A study of fertility in the blowfly, Phormia regina Meigen, F. A. Cowan (*Ohio Jour. Sci., 32 (1932), No. 4, pp. 389–392*).—This is a report of studies conducted in continuation of those on the use of blowfly larvae in the treatment of osteomyelitis, by Miller and his associates (E. S. R., 67, p. 437).

The author found that "in the males of *P. regina* sperms are present regularly on the third day and sometimes as early as the first day after emergence. Adult males continue to produce sperms throughout their life (at least 28 days). Although both larval and adult feeding affect fertility and oviposition in the female, fertility in the male is not affected by the length of larval feeding nor by the absence of protein from the diet of the adult. Males kept for 6 days without any food whatsoever produced sperms normally until death from starvation. Sperms remain functional in the females for at least 11 days after separation from the males."

Observations and experiments on the dispersion of the convergent lady-beetle (Hippodamia convergens Guérin) in California, W. M. Davidson (*Amer. Ent. Soc. Trans., 50 (1924), No. 3, pp. 163–175, figs. 3*).—In a study of the dispersion of 430,000 marked convergent lady beetles in the Imperial Valley of California, it was found that when the masses of beetles are transported to lower altitudes and released under a higher temperature in the daytime they fly off immediately and distribute themselves over large areas. When released at night the beetles migrate similarly the day following. This migratory habit prevents the beetles from being controlled satisfactorily in restricted areas.

The relative toxicity of pyridine and nicotine in the gaseous condition to Tribolium confusum Duval, C. H. Richardson and L. E. Haas (*Iowa State Col. Jour. Sci., 6 (1932), No. 3, pp. 287–298, figs. 6*).—This is a report on the determination of the relative toxicity of gaseous pyridine and nicotine to the adult confused flour beetle, contributed from the Iowa Experiment Station. "The toxicity of the gases was determined in a close apparatus, the essential feature of which was the presence of glass throughout the portions in contact with the gas. Gas concentration was regulated by flow meters. The relative toxicity of pyridine and nicotine is approximately the same at all time-concentration levels. At 25° C. nicotine is about 31 times as toxic as pyridine to *T. confusum*. Neither pyridine nor nicotine showed marked anesthetic properties in these experiments. Partial recovery was more pronounced from nicotine than from pyridine."

A list is given of 23 references to the literature.

A new pest on raspberry, R. Hutson (*Michigan Sta. Quart. Bul., 15 (1932), No. 2, pp. 68–70, figs. 2*).—A brief account is given of work with a gall-forming buprestid borer of the genus Agrilus, tentatively identified as *A. communis rubicola*, which was observed on raspberries during the growing season of 1931 and resulted in the canes of the plants breaking over during the latter part of July, 1932. Examination showed from 35 to 50 per cent of the canes to have been broken off at various distances from the ground due to the spiral

burrowing of Agrilus larvae deep in the woody supporting tissue of the plant. The larvae which caused the damage were found to hatch from tiny eggs laid on the surface of the bark. It is thought that the application of arsenate of lead in late May or early June will reduce the infestation, and that cutting gall canes and burning will destroy enough overwintering larvae to effect a good percentage of control. Since the beetle attacks the rose (E. S. R., 66, p. 456), it is recommended that the planting of *Rosa rugosa* in the neighborhood of raspberries be avoided.

Immature stages of some Japanese cerambycid-beetles, with notes on their habits, T. KOJIMA (*Jour. Col. Agr., Imp. Univ. Tokyo, 10 (1929), No. 2, pp. 101–128, pl. 1, figs. 5*).—Five species representing as many genera are dealt with, namely, *Batocera lineolata* Chevr., *Apriona rugicollis* Chevr., *Cagosima sanguinolenta* Thoms., *Thyestilla gebleri* Fald., and *Aulaconotus pachypezoides* Thoms.

Further investigation on the immature stages of some Japanese cerambycid-beetles, with notes on their habits, T. KOJIMA (*Jour. Col. Agr., Imp. Univ. Tokyo, 11 (1931), No. 3, pp. 263–308, pl. 1, figs. 14*).—In this second contribution the author reports upon studies of the immature stages of 15 species, of which 3 represent the subfamily Prioninae, 2 the Cerambycinae, and 10 the Laminae. These forms are recorded with notes on their life histories and habits.

A preliminary list of the Chinese Scarabaeidae, C. LIU (*China Jour., 17 (1932), No. 2, pp. 88–90*).—The list here presented includes 49 species and 3 varieties of Scarabaeidae occurring in China.

The Black Hills beetle (Dendroctonus ponderosae Hopk.), M. W. BLACKMAN (*N. Y. State Col. Forestry, Syracuse Univ., Tech. Pub. 36 (1931), pp. 97, pls. 10, figs. 6*).—Following an introduction, the author deals with the history of the Black Hills beetle, its morphology and biology, secondary and associated bark beetles, factors affecting the Black Hills beetle, experimental treatments of normal and infested trees, and methods of control of the beetle, together with a summary and a bibliography of 15 titles.

Breeding the honeybee under controlled conditions, W. J. NOLAN (*U. S. Dept. Agr., Tech. Bul. 326 (1932), pp. 50, figs. 16*).—Following an introduction, the subject is dealt with under the headings of status of work on breeding under controlled conditions, breeding work at the bee culture laboratory, results of artificial insemination, new instruments and methods for artificial insemination, marking individuals, drones, queen rearing and testing, viability of spermatozoa, successive inseminations, mixing sperm from different drones, optimum age of queen for artificial insemination, and succession of generations. The account is accompanied by a list of 54 references to the literature.

It was found that spermatozoa will remain alive under the cover glass or in the spermatheca of a dead queen for several hours at ordinary summer temperature; that successive artificial inseminations of a queen, at least before she begins egg laying, can be made with good results; and that sperm from different drones can be mixed together without apparent effect on some of the spermatozoa at least. Worker brood was reared from a queen inseminated when 29 days old. In 1930 and 1931 greater success was had with queens 17 days of age or older than with younger queens. A succession of generations of the honeybee is possible through the use of artificial insemination. Four generations is the largest number yet obtained at Somerset, Md., in one season although under optimum conditions it should be possible to obtain a generation a month during the active season.

Drifting of honeybees, C. L. CORKINS (*Wyoming Sta. Bul. 190 (1932), pp. 24, figs. 3*).—This is a report of studies of the problem of drifting, which is im-

portant to research apiculturists, commercial queen breeders, and commercial beekeepers, where records, particularly of production, of individual colonies are desired.

The work reported shows the percentage of interdrift of 20 colonies of bees weekly by counting samples of 1,500 bees per colony. "There were 237,000 bees counted over a period of 10 weeks. Interdrift, only, was determined by the use of two races of bees of different colors. The mean percentage of drift of all colonies for the entire season was 2.21 ± 0.03. The mean of the means of each colony each week, excluding the data of the two hybridized colonies, was 1.77 ± 0.06 per cent, with a standard deviation of only 1.01 per cent. There was a slight tendency of the Caucasian race of bees to drift more than the Italian race of bees. There was no indication of any significant difference in the tendency of weak colonies to drift more than strong colonies. The crowding of a large number of colonies into a small yard did not tend to increase drifting. The dispersion of the percentage drift of different colonies in the yard is small.

"These data indicate that drifting does not vitiate the records of individual colonies in a yard. This is of particular importance in the reliability of individual colony honey production records."

Notes on the habits of the cockroach-hunting wasps of the genus Ampulex, sens. lat., with particular reference to Ampulex (Rhinopsis) caniculatus Say, F. X. Williams (*Hawaii. Ent. Soc. Proc., 7 (1929), No. 2, pp. 315–329, figs. 10*).—An extended account of the author's observations.

Three new ichneumonoid parasites of the rice-borer (Chilo simplex (Butler)), R. A. Cushman (*Hawaii. Ent. Soc. Proc., 7 (1929), No. 2, pp. 243–245*).—Under the names *Centeterus alternecoloratus, Dioctes chilonis,* and *Chelonus chilonis,* three species parasitic on the Asiatic rice borer at Foochow, China, are described as new.

The hosts of Cremastus hymeniae Viereck in Hawaii (Hymenoptera), O. H. Swezey (*Hawaii. Ent. Soc. Proc., 7 (1929), No. 2, p. 281*).—A list is given of the hosts, some 30 in number, of *C. hymeniae,* an important parasite of the coconut leaf roller.

Importation into Jamaica of a parasite (Eretmocerus serius Silv.) of the citrus black fly (Aleurocanthus woglumi Ash.), W. H. Edwards (*Jamaica Dept. Sci. and Agr., Ent. Bul. 6 (1932), pp. [2]+12*).—This is a report on the importation of the parasite *E. serius* into Jamaica for the control of the citrus black fly. An account of work with this parasite by Clausen and Berry has been noted (E. S. R., 68, p. 218).

Two new species of Phanomeris Foerster (Hymenoptera, Braconidae) parasitic on leaf-mining sawflies, C. F. W. Muesebeck (*Ent. Soc. Wash. Proc., 34 (1932), No. 5, pp. 81–83*).—*P. metalli* reared from *Metallus rubi* Forbes, mining leaves of blackberry at Fredonia, N. Y., and *P. phyllotomae* reared from *Phyllotoma nemorata* Fall. at the Gipsy Moth Laboratory, Melrose Highlands, Mass., received from Austria, are described as new. A number of adults of *P. phyllotomae* are said to have been liberated in an infestation of *P. nemorata* at North Conway, N. H.

An egg parasite of thrips in Hawaii, C. E. Pemberton (*Hawaii. Ent. Soc. Proc., 7 (1931), No. 3, pp. 481, 482*).—An account of parasitism of the greenhouse thrips by the trichogrammatid *Megaphragma mymaripenne,* described by P. H. Timberlake in 1923[2] from specimens associated with thrips. The numbers of the emergence holes and the relative unimportance of the greenhouse thrips suggest that the parasite is an important factor in control of the thrips in Hawaii.

[2] Hawaii. Ent. Soc. Proc., 5 (1924), No. 3, p. 414.

Tarsonemus ananas Tryon, a mite that is becoming a serious pest of pineapples in Hawaii, J. F. ILLINGWORTH (*Hawaii. Ent. Soc. Proc., 7 (1931), No. 3, pp. 409, 410*).—A note on the mite *T. ananas*, which appears to be the cause of considerable damage to pineapple fruit.

Spider poisoning: A study of the toxin of the black widow spider (Latrodectus mactans), W. W. HALL and W. A. VOGELSANG (*U. S. Naval Med. Bul., 30 (1932), No. 4, pp. 471–478, pls. 2*).—The authors report that the chain of severe symptoms resulting from a bite of *L. mactans* is caused by a nonhemolytic neurotoxin, which apparently acts on nerves and nerve endings. Experimental animals bitten on the abdomen, succumbing after 48 to 72 hours, show areas of necrosis in the liver, kidneys, spleen, and adrenals. A single bite establishes immunity. Immune (antitoxin) serum protects only when given immediately after the bite. Given later it does not seem to alter the course of the reaction.

ANIMAL PRODUCTION

Growth and development with special reference to domestic animals.—XXIV, The decline in energy metabolism per unit weight with increasing age in farm animals, laboratory animals, and humans, S. BRODY ET AL. (*Missouri Sta. Research Bul. 176 (1932), pp. 59, figs. 28*).—Data and discussions, in continuation of previous work (E. S. R., 67, p. 586), are presented on the resting and basal energy metabolism per unit of weight as a function of age for dairy and beef cattle, sheep, horses, and swine from birth until about 3.5 years of age. Basal metabolism data are also given for white rats grown under various conditions of food supply, particularly when the food was limited so that the live weight of the immature animals remained constant.

The data, which are presented chiefly in graphical form, are analyzed mathematically, and in the case of normally fed animals are shown to follow the age curve represented by the equation $Q/m=Ae^{-kt}+C$, in which Q is the heat production for the weight m and age t. Data on the basal metabolism of humans and pigeons are also analyzed mathematically, especially as related to the period of senescence, and it was shown that there was a slight but unmistakable decline in metabolism per unit of weight with increasing age during this period. Gestation was shown to increase metabolism per unit of weight, and lactation still further increased it. In sheep there was a marked seasonal variation per unit of weight, with the peak occurring in the spring and the low point in late autumn.

Discussions are presented to interpret the data regarding the factors "shaping the entire life curve of metabolism per unit weight; the probable relative influence of the visceral organs, surface area, and live weight on the basal metabolic rates; the relative influences of body weight, age, and relative physiological maturity on the metabolic rate; species comparisons of age changes in metabolic rates; and units of reference for metabolic rates."

Seasonal changes in the chemical composition of range forage and their relation to nutrition of animals, G. H. HART, H. R. GUILBERT, and H. GOSS (*California Sta. Bul. 543 (1932), pp. 62, figs. 9*).—Chemical analyses of 400 samples of range forages, comprising six individual species of plants and also composite samples containing more than one species, were made at different stages of growth and seasons of the year. The growth stages throughout a two-year period represented the early green vegetative stages following the first rains to the dry, bleached, and leached forages at the end of the dry season.

The analyses, presented in tabular form, show a remarkable change in the nutritive value of the plants, the dry matter varying from a protein-rich concentrate during the early vegetative stages to a poor roughage during the drought period. The difference in composition between species was more marked than the difference within species even when grown on different areas. The value of a range, therefore, depends to some extent upon the relative abundance of the species which maintain high nutritive values over a long period of the year.

Bur clover maintained relatively high nutritive value throughout the year, partly due to the fact that the burs were available after they had matured and fallen to the ground. In this respect bur clover was the outstanding individual species. Annual grasses and broadleaf alfilaria were valuable early feeds but had a comparatively short period for furnishing adequate nutrition. Redstem alfilaria remained green longer in the season, was higher in protein and ash, and lower in fiber at corresponding stages of growth than the broadleaf. The white stem alfilaria appeared similar in composition to the redstem. All the alfilaria species were remarkably high in silica-free ash and unusually so in calcium, while grass species were usually low in calcium and total minerals. The efficient use of a range depends upon the ability of the owner to utilize the various species when they are most valuable or to properly supplement the forage when deficient and not solely upon the abundance of forage in relation to the number of animals grazed.

Analyses of samples from burned and unburned areas showed in one area a decided increase in phosphorus in broadleaf alfilaria and to a less extent in wild oats on the burned area. These findings did not check with samples taken from two other areas with more fertile soil. Analyses of samples of browse consisting of sweet birch and bitterbrush and a few samples of grass and clover from mountain meadows obtained in cooperation with the U. S. D. A. Forest Service, together with observations on the condition of the animals, reports of depraved appetite, and other clinical evidence indicated the existence of nutritional problems in the higher elevations.

Data on the effect of rain on dry forage (E. S. R., 65, p. 658) have been augmented and summarized in this bulletin. The results of a few tests show a wide variation in the vitamin A content of the livers of range steers at the time of slaughter, depending upon their previous feed supply. The results of digestion trials, some of which have been previously noted (E. S. R., 65, p. 658), show that bur clover has a relatively high nutritive value as compared to dry grass and alfilaria. They also show that dry, bleached, and leached forage when properly supplemented may furnish a cheap source of energy.

Observations are given on problems connected with reproduction in range cattle, high mortality in newborn calves, and the deformity known as "acorn calves."

Effect of weathering and stage of maturity on the palatability and nutritive value of prairie hay, F. W. Christensen and T. H. Hopper (*North Dakota Sta. Bul. 260 (1932), pp. 55, figs. 4*).—In this investigation digestion trials with steers were conducted on the following hays: (1) April cutting—old dried grass from the previous season's growth, (2) July cutting—grass cut at the height of the growing season, (3) October cutting—grass cut at the close of the growing season, (4) biennial cutting—hay from a plat cut once in two years, and (5) annual cutting—hay from a plat cut every year. Western needle grass (*Stipa comata*) made up from 50 to 75 per cent of the grass in the hay, while some 50 or more species of plants entered into the hay. About 50 per cent by weight of the hay was made up of grasses.

A marked difference in palatability was observed. The July cutting was most palatable, followed in descending order by the October and April cuttings, and annual cutting was more palatable than biennial cutting. There were but slight variations in the amount of water consumed per pound of dry matter eaten. In chemical composition the April and October cuttings were similar, while the July cutting varied from them in having a higher content of protein and nitrogen-free extract and a lower crude fiber content. The biennial and annual cuttings were similar in composition.

The following table gives the coefficients of digestibility obtained for the various constituents of the different hays:

Digestibility of prairie hay of various cuttings

Kind of nutrient	April	July	October	Biennial	Annual
	Per cent	*Per cent*	*Per cent*	*Per cent*	*Per cent*
Crude protein	0.0	51.0	10.3	38.0	41.1
Crude protein corrected for "metabolic" nitrogen	84.8	81.6	87.7	81.6	83.9
Nitrogen-free extract	54.4	67.0	49.8	57.3	60.0
Ether extract	32.1	34.0	38.7	38.9	20.7
Total digestible nutrients	52.3	60.1	48.5	52.5	53.8
Dry matter	48.3	59.7	45.3	50.1	52.6

The percentage digestibility of ash was negative in the April and October cuttings, negative with two steers and positive with two on the annual and biennial cuttings, and positive for all on the July cutting. The digestibility of crude fiber ranged from 55.4 in biennial cutting to 65.6 in July cutting. Nitrogen balances showed that all steers gained in this respect on the July cutting, but lost on all other hays. On the basis of the Haecker standard the steers received less than a maintenance ration when consuming the April and biennial cuttings, a maintenance ration on the annual cutting, a little more than maintenance on the October cutting, and considerably above maintenance on the July cutting. Similar results were obtained by comparing the rations on a net energy basis.

The yield of hay cut annually ranged from 29 to 652 lbs. per acre over a 10-year period with an average of 304 lbs., while with the biennial plats the average yield was 714 lbs., ranging from 348 to 1,385 lbs. The average yield of digestible crude protein was 8.1 and 17.1 lbs. and of total digestible nutrients 144 and 329 lbs. on the annual- and biennial-cut plats, respectively. While more hay was obtained by cutting once in two years, digestion trials and feeding tests showed that the hay produced in this manner was less digestible and had lower palatability than hay cut annually.

Newer developments regarding silos and silage, A. E. PERKINS (*Ohio Sta. Bimo. Bul. 159 (1932), pp. 207–214*).—The development of silos in this country, the improvements in silos and filling machinery, the use of silage as a feed, the crops and mixtures of crops that may be successfully ensiled, and the use of pit and trench silos are discussed in this article.

The composition and utilization of Texas feeding stuffs, G. S. FRAPS (*Texas Sta. Bul. 461 (1932), pp. 63*).—The constituents of feeding stuffs, their digestion, utilization, and composition are discussed in this bulletin. The average composition of over 600 kinds or classes of feeding stuffs, based on more than 22,000 selected analyses, are given in tabular form, and the variations in composition of feeds are discussed. The average productive energy and digestible protein values are given for a large number of feeds. Suggestions are made for calculating standards for feeding, together with methods for calculat-

ing the cost of protein, productive energy, and bulk, and for calculating the constituents of a ration and for reducing the cost.

[Experiments with livestock] (*North Carolina Sta. Rpt. 1931, pp. 53–55, 56–61, 116–118, 119–127, figs. 3*).—Progress reports are presented of studies with cattle on the effect of rations upon the quality of carcass, the vitamin A requirements of beef cattle, a comparison of carbonaceous roughages for fattening steers, the value of reeds (*Arundinaria tecta*) for summer pasture, the value of crop gleanings for wintering cattle, and the value of fertilizers for pasture.

With sheep the report includes data on the cost of raising lambs to marketable age and upgrading native eastern North Carolina sheep.

Swine studies include data on the value of mineral supplements for breeding and fattening swine, a comparison of crab meal, fish meals, cottonseed meal, and soybean meal as protein supplements, white v. yellow corn for fattening pigs, cottonseed meal for brood sows, utilization of pasture crops by swine, effect of retarded early growth on the final development of pigs, permanent pastures for fattening pigs, soft pork, and quantity of salt for curing meat.

All of the above studies were in charge of E. H. Hostetler.

Nutrition studies under the direction of J. O. Halverson dealt with factors causing lameness and death among pigs on a ration of white corn, fish meal, and mineral mixture, and the effect of the ration on the ability of the albino rat to rear young.

Poultry studies reported data on the growth rates of chicks receiving cod-liver oil and no sunlight as compared with those receiving sunlight and no cod-liver oil, grazing crop experiments, plat studies for chicks and developing stock ranging, influence of protein levels on the development of chicks in battery brooders, and a comparison of fish meal against meat meal as single sources of animal proteins to laying flocks.

[Experiments with livestock] (*Pennsylvania Sta. Bul. 279 (1932), pp. 10–13, 17, fig. 1*).—This report includes data on the progress of studies with swine, sheep, cattle, and poultry.

With swine the studies included comparisons of corn and barley for fattening pigs on rape pasture; fish meal and skim milk as protein supplements to corn; and barley, wheat, and corn for fattening pigs, all by M. A. McCarty; and the optimum degree of fineness in grinding grains for growing and fattening swine, by McCarty and J. E. Nicholas.

The poultry work was made up of studies of the hock disease of poultry, by J. E. Hunter, H. C. Knandel, R. A. Dutcher, and N. B. Guerrant; the relation of plumage changes to egg production, by D. R. Marble; the rearing of the ring-necked pheasant, by E. W. Callenbach; and raising turkeys, by Knandel and Hunter.

Sheep and cattle studies included a comparison of native fine wool lambs, native mutton lambs, and western bred lambs as feeders, by W. L. Henning; linseed meal as a source of protein for growing and fattening lambs, by T. B. Keith; and a comparison of grades of feeder cattle for fattening purposes, by F. L. Bentley.

Panguitch Livestock Experimental Farm: Progress report, B. F. Hulme (*Utah Sta. Bul. 237 (1932), pp. 20, figs. 2*).—The early history of this substation, the development of the livestock, and information on weather conditions are given in this bulletin.

Pasture experiments were undertaken with cattle in 1926 to determine the value of rotating pastures, using a unit of four Shorthorn cows each with a suckling calf as experimental animals. There has been a marked contrast in

the species of plants found on the rotated and nonrotated pastures. The carrying capacity of a pasture was increased, greater gains were obtained, and the beneficial effects were found to be more cumulative following the practice of rotation.

In other studies it was found that mature dry cows, weighing approximately 1,100 lbs., could be brought through the winter in good breeding condition on a ration of 10 lbs. of alfalfa hay and straw ad libitum. Such a ration cost about one-half as much as a full feed of alfalfa hay. More liberal protein rations were necessary for heifers and cows suckling calves.

Studies with sheep were also conducted, covering such phases as the effect of winter feeding and shelter on the quantity and quality of wool, the market value of crossbred lambs sired by rams of different breeds, and the value of fleeces from B and C type Rambouillets.

Of 14 varieties of alfalfa planted in 1931, Saskatchewan 666 proved to be the best yielder in this section.

Ration experiment with calves: Progress report of livestock feeding experiment, 1932, G. E. Morton and H. B. Osland (*Colorado Sta. Press Bul. 78 (1932), pp. 12, fig. 1*).—Continuing this study (E. S. R., 67, p. 59), 8 lots of 10 calves each, averaging about 420 lbs. per head, were fed for 194 days on a basal ration of wet beet pulp and alfalfa hay. In addition the respective lots received ground corn, ground barley, and 0.5 lb. of cottonseed cake per head; ground corn, ground barley, and 1 lb. of cottonseed cake; ground corn, ground barley, and 1.5 lbs. of cottonseed cake; ground corn, ground barley, and 1 lb. of linseed cake; ground corn, ground barley, and 1 lb. of flaxseed; ground barley and 1 lb. of cottonseed cake; cracked wheat and 1 lb. of cottonseed cake; and ground corn, cracked wheat, and 1 lb. of cottonseed cake. The average daily gains in the respective lots based on market weights were 2, 2, 2, 2, 2.2, 2, 2, and 2.3 lbs. per head.

In these tests 0.5 lb. of cottonseed cake was sufficient for economical gains. The feed replacement value of cottonseed cake and linseed cake was practically equal, but the cost per unit of gain was higher when linseed cake was fed. The results indicate that ground flaxseed is not dangerous for fattening cattle, that it can be used to good advantage as a protein supplement in a beet by-product ration, and that it gives feeders a home-grown feed to replace cottonseed cake and linseed cake when the commercial value of flax permits. Wheat, particularly when fed as part of a grain mixture, was a good cattle feed, though tending to promote growth rather than finish. Ground barley as the only grain produced larger and more economical gains and returned a greater profit than ground wheat alone. Adding ground corn to ground barley in this test was not economical.

Rations for fattening beef calves, G. A. Branaman (*Michigan Sta. Quart. Bul. 15 (1932), No. 2, pp. 95–99*).—Continuing these comparisons (E. S. R., 67, p. 60), 3 lots of 10 calves each, averaging approximately 406 lbs. per head, were fed for 196 days on a basal ration of linseed cake, corn silage, and alfalfa hay. The respective lots received in addition ground barley, shelled corn, or ground oats and made average daily gains of 2.2, 2, and 2 lbs. per head. The cost per 100 lbs. gain was lowest for the barley-fed calves, while the pigs salvaged enough corn to make the cost in that lot slightly below that of the oat-fed lot. Lots 1 and 2 were somewhat fatter than lot 3 at the end of the test. The cost of grinding the grain changed the relative value of barley and oats as compared to corn.

In the second phase of the study 3 lots of calves were fed for a total of 294 days, divided into 3 periods of 98 days each. A basal ration of corn silage and alfalfa hay was fed for the entire period. During the first period lot 3

received ground oats and linseed cake and lot 4 linseed cake; in the second period lot 3 received ground oats and linseed cake and lots 4 and 5 shelled corn and linseed cake; and in the third period all lots received shelled corn and linseed cake. The average daily gains in the respective lots for the entire feeding period were 2.1, 1.8, and 1.7 lbs. per head. The cost per pound of gain was lowest in lot 4 and highest in lot 3. The market value was highest in lot 3 and lowest in lot 5.

Fattening steer calves, P. Gerlaugh (*Ohio Sta. Bimo. Bul. 159 (1932), pp. 215–217*).—Continuing this study (E. S. R., 66, p. 656), five lots of 20 calves each, averaging approximately 394 lbs. per head, were fed, mostly for 280 days, on a basal ration of 7 lbs. of corn silage and 1.5 lbs. of mixed clover and timothy hay. Lots 1, 2, and 3 received 2 lbs. of a protein supplement made up of equal parts of linseed meal and cottonseed meal; lot 4, 1 lb. of this supplement; and lot 5, about 1.6 lbs. of a supplement composed of equal parts of linseed meal, cottonseed meal, and dry rendered tankage. Lots 1, 2, and 3 were full-fed shelled corn, lot 4 received in addition 1 lb. of corn to replace the pound of supplement, and lot 5 received the same amount of corn as lot 1. Lot 2 was fed 0.5 and lot 3 1 lb. of cane molasses.

The average daily gains were 1.8, 2, 2.1, 1.8, and 1.9 lbs. per head in the respective lots. Feeding molasses increased feed consumption and the average daily gains, but calves so fed tended to be growthier than those not receiving molasses. Lot 4 made somewhat smaller but cheaper gains than lot 1, but the finish was practically the same in both lots. The calves in lot 5 required less protein supplement, made cheaper and greater gains, had better appetites, and probably would have had a better finish than those in lot 1 had they been fed corn according to appetite.

Cattle farming in South Africa, A. M. Bosman ([*Johannesburg*]: *Central News Agency, 1932, pp. 458, pls. 36, figs.* [*21*]).—This treatise was prepared to give practical guidance to those interested in the cattle industry in South Africa. The economic phases of the industry, the principles of breeding and feeding, the value and use of available feeds, and the care and management of cattle are discussed in detail.

Liberal v. limited rations for breeding ewes during winter season, G. W. Putnam and L. H. Blakeslee (*Michigan Sta. Quart. Bul., 15 (1932), No. 2, pp. 100–102*).—A study covering a period of 3 years was conducted at the Upper Peninsular Substation, using 3 lots of ewes averaging 26 head per lot each year. The lots were fed the same grain ration during gestation, but lot 1 received a full feed of approximately 4 lbs. of legume hay per head daily; lot 2, a three-fourths ration of legume hay; and lot 3, a half ration of legume hay and approximately the same amount of straw.

The refused roughage was 0.4 lb., practically 0, and 0.5 lb. per head daily in the respective lots. Lot 1 made larger gains during the gestation period but lost more weight while lambing and gained less on pasture. All lots weighed approximately the same when the lambs were weaned. Lot 1 produced 154 per cent of living lambs; lot 2, 147 per cent; and lot 3, 151 per cent. While there was a slight difference in the birth weight of the lambs, there was practically no difference in their strength and vitality. Both twin and single lambs from each lot made satisfactory gains from birth to weaning. The total feed cost of wintering was $3.34, $2.60, and $2.58 per ewe in the respective lots.

Experiments with permanent pastures for sheep, A. B. Dorrance, G. A. Brown, and H. C. Rather (*Michigan Sta. Quart. Bul., 15 (1932), No. 2, pp. 59–68, figs. 2*).—A series of experiments was begun in 1929 at the W. K. Kellogg Farm in an effort to determine the best means of providing adequate pastures on

rather worn-out sandy soils. Little could be reported for the 1929 and 1930 seasons, but the 1931–1932 years yielded some interesting results.

Of the pastures tested alfalfa had the greatest carrying capacity, returned the greatest total gains with sheep, and was the least expensive of all plats receiving any fertilizers. The early season gains on alfalfa were rather irregular but later gains were fairly steady, and a higher percentage of the alfalfa-fed lambs were in market condition in August than lambs from other plats. By keeping the sheep on alfalfa day and night no difficulties were experienced with bloat.

Permanent pastures on these soils were not adequate, largely because of the droughty soils. The grasses that grew without fertilizers were relatively unpalatable and unproductive, and when fertilized did not give returns in proportion to the cost of the fertilizer.

Feedlot fattening rations for lambs, G. E. Morton and B. W. Fairbanks (*Colorado Sta. Press Bul. 79 (1932), pp. 16*).—Continuing these tests (E. S. R., 66, p. 359), 18 lots of 24 lambs each, averaging approximately 64 lbs. per head, were fed for 114 days. Alfalfa hay and salt were fed in all lots. In addition the respective lots received shelled corn; barley; barley and cottonseed meal; barley and ground flaxseed; barley and wheat mixed feed and screenings; barley and linseed meal; wheat, linseed meal, and wet beet pulp; wheat; wheat, cottonseed meal, and wet beet pulp; wheat and ground flaxseed; wheat and linseed meal; wheat and cottonseed meal; wheat, ground flaxseed, and wet beet pulp; barley, ground flaxseed, and wet beet pulp; barley, cottonseed meal, and wet beet pulp; barley, linseed meal, and wet beet pulp; barley, wheat mixed feed and screenings, and wet beet pulp; and barley and wet beet pulp. All of the grains were fed whole. The average daily gains in the respective lots, based on market weights, were 0.3, 0.3, 0.3, 0.3, 0.3, 0.4, 0.3, 0.4, 0.3, 0.3, 0.3 0.4, 0.4, 0.3, 0.3, 0.4, and 0.3 lb. per head.

In every case the addition of cottonseed meal increased the rate of gain and improved the finish, and with every ration except barley and wet beet pulp decreased the cost of gains and improved the dressing percentage. Linseed meal also proved to be an excellent protein supplement, but was too high in price as compared with other available supplements. Ground flaxseed was found to be a useful protein supplement, its value depending upon its feed replacement value and that in turn being influenced by the price of the feeds replaced. In this test a ration made up of barley, wheat mixed feeds and screenings, wet beet pulp, and alfalfa hay produced the largest and most economical gains, the highest dressing percentage, and the greatest profit per lamb, and every carcass from this lot graded choice. In this study the wheat-fed lambs returned a greater profit than the corn-fed lambs. The relative value of these two feeds depended upon their price. There was no difference in the carcasses of lambs fed wheat and those fed corn.

The physiology of normal and Frizzle fowl, with special reference to the basal metabolism, F. G. Benedict, W. Landauer, and E. L. Fox (*Connecticut Storrs Sta. Bul. 177 (1932), pp. 11–101, figs. 6*).—In cooperation with the nutrition laboratory of the Carnegie Institution of Washington, a study was undertaken on the respiratory metabolism of adult hens and cocks of normal, molting, and Frizzle fowl. A few measurements were made by direct calorimetry, but most of them were made by the indirect method, including the use of the Carpenter gas analysis apparatus.

At environmental temperatures between 28 and 15° C. the rectal temperatures of all chickens were about 41°. There were no pronounced differences that could be ascribed to length of fasting up to 72 hours, to environmental temperatures of as low as 15°, to sex, or to condition of plumage. At environmental temperatures below 15°, homozygous Frizzle fowls, particularly the very bare

ones, had subnormal rectal temperatures. The surface temperatures of the wattles, comb, ear lobe, and legs, and the temperatures on the breast and back under fasting conditions and with food and irrespective of plumage condition were higher than the environmental temperature, and tended to increase as the environment became warmer. This fact indicated that the head appendages and legs of the fowl were as much heat-losing surfaces as the feathers, and that these areas should be included in any calculation of surface area. With homozygous Frizzle fowl the surface temperatures on the breast and back were nearly 6° higher than with normal fowls.

It was found that normal fowl had to fast 48 hours before the fat quotient was reached and basal metabolism established, and that this state remains fairly constant for 24 hours. Changes in environmental temperatures within the limits of 15 to 28° did not affect the metabolism of the normal fowl, the heat production averaging 866 calories per square meter of body surface for 24 hours for hens and 838 calories for cocks. At night the average heat production of normal hens was 709 calories and of cocks 663 calories. Normal molting hens at 28° had an average heat production of 844 calories, while at 17 to 19° the heat production ranged from 1,291 to 1,611 calories. The Frizzle fowl at 28° had a higher fasting heat production than the normal fowl, the rate being nearly in proportion to the defective nature of the plumage. At 17° the heat production of the Frizzle fowl was sometimes twice that of the normal fowl. The metabolism of the homozygous Frizzles increased about 4 per cent for each degree decrease in temperature from 28 to 17°.

The output of water vapor per kilogram of body weight for 24 hours ranged from 50 to 60 g for normal and between 30 and 35 g for Frizzles. The proportion of total heat production lost in vaporization of water amounted to 49 per cent for the normals and 17 per cent for Frizzles. The feed consumption of homozygous Frizzles, especially at low temperatures, was higher than that of the normal birds, but the physical activity of the former was less than that of the latter, except for eating.

While the only abnormality shown by newly hatched Frizzle chicks was in the down feathers, adults showed a lack of fat deposits, enlarged thyroid, increased heart rate, hypertrophy of the heart, decrease of hemoglobin content of the blood, frequently sterility, and low hatchability of eggs. The original cause of these abnormalities was probably due to the defective plumage, which caused a high loss of body heat and an increased metabolism. It is concluded that the thyroid enlargement was of a compensatory nature, which was confirmed by the fact that when a bird was suddenly changed from a low to a high environmental temperature it showed temporary symptoms of hyperthyroidism.

The number of chicks required to demonstrate the significance of growth differences, C. H. Schroeder and H. B. Lawrence (*Poultry Sci., 11 (1932), No. 4, pp. 208–218, figs. 7*).—Based on the results of a feeding test with 832 Rhode Island Red and 792 White Leghorn chicks fed, housed, and managed under identical conditions, the authors have worked out a table showing the number of chicks of one sex necessary to satisfactorily demonstrate differences in the mean of body weight gains amounting to 2.5, 5, 10, and 20 per cent, respectively, when the coefficient of variability amounted to 10, 12, 14, 16, 18, 20, 22, and 24 per cent, respectively.

Nutritive requirements of poultry.—VII, Growth in chickens, III, G. S. Robertson, J. B. Orr, J. H. Prentice, and A. J. Macdonald (*Scot. Jour. Agr., 13 (1930), No. 4, pp. 410–415*).—Continuing this series of studies (E. S. R., 65, p. 257), it was found that a supplement of common salt was necessary for normal growth and health of chickens on a ration of cereals and soybean meal.

Under the conditions of these tests sulfur, iron oxide, and potassium iodide could be omitted from the mineral supplement without any deleterious effects.

[Experiments with poultry] (*Maine Sta. Bul. 360 (1931), pp. 172–174, 175–177, fig. 1*).—Data are reported on the influence of antirachitic substances on growth in poultry, by W. F. Dove, poultry housing, and the effect of red lights on the prevention of cannibalism.

Wheat meal in all-mash rations for poultry, I. W. Rhys (*Harper Adams Util. Poultry Jour., 17 (1931–32), No. 8, pp. 352–356*).—In this study at the National Institute of Poultry Husbandry it was found that wheat meal could replace up to 80 per cent of corn meal in an all-mash ration without adversely affecting the growth of White Leghorn chicks. However, the economy of the practice depended upon the relative cost of the two feeds.

Lime and phosphoric acid requirements for chicks, R. M. Sherwood (*Texas Sta. Bul. 462 (1932), pp. 14*).—A series of four experiments was undertaken to determine the mineral requirements of growing chicks. White Leghorn chicks were fed from hatching to 6, 8, or 12 weeks of age. The mineral content of the ration was varied so far as calcium and phosphorus were concerned to find what percentage of each would produce the best growth. For the first 6 or 8 weeks it required from 0.65 to 0.87 per cent of phosphorus and 1.07 to 2.14 per cent of calcium to produce the greatest gains. When chicks were fed to 12 weeks on rations containing from 12 to 18 per cent of dried buttermilk, from 0.48 to 0.53 per cent of phosphorus gave the most satisfactory gains in weight. Under these conditions the lime requirement was equivalent to 0.93 to 1.36 per cent of calcium.

The etiological factors involved in the malformation of bones in young chickens, L. F. Payne, J. S. Hughes, and H. F. Leinhardt (*Poultry Sci., 11 (1932), No. 3, pp. 158–165*).—A series of four experiments was undertaken at the Kansas Experiment Station to study the effects of (1) high and low room temperatures, (2) high and low protein diets, (3) restricted and liberal room for exercise, and (4) solid board v. wire floors on the development of "slipped tendon" in chicks.

It is concluded that intensive methods of brooding may be a contributing factor in the development of slipped tendons when the mineral portion of the ration is not properly balanced. A mineral mixture of chemically pure calcium phosphate and calcium carbonate produced the same bad effects as an equivalent amount of steamed bone meal. An excessive amount of either phosphorus or calcium or both was an important etiological factor in the development of this condition. A histopathological study of the organs and tissues and a chemical analysis of the blood and bones failed to reveal any abnormalities, indicating that the condition is of an anatomical rather than a histological nature.

Relation between breaking strength and the percent of egg shell, C. L. Morgan (*Poultry Sci., 11 (1932), No. 3, pp. 172–175*).—A statistical study was undertaken at the South Carolina Experiment Station to determine the relationship between the breaking strength of egg shell and the percentage of shell. The data were obtained in connection with a study on the effect of adding cod-liver oil to a standard laying ration fed to hens on free range. The study was concerned with both White Leghorns and Barred Plymouth Rocks. A definite positive correlation was found to exist between the percentage of shell of an egg and its breaking strength. Within certain limits the feeding and management practices that tended to increase the percentage of shell were important factors in the production of market eggs of good shipping and handling qualities.

A triple-yolk egg, T. B. Clark (*Poultry Sci., 11 (1932), No. 3, p. 176*).—The finding of a triple-yolked egg is reported from the West Virginia Experiment

Station. This egg was approximately the same weight as an average egg, but the total amount of yolk was about one-third more than that found in a normal egg. The egg came from a flock of pullets that six days previous to this finding had been vaccinated for fowl pox, and the author believes that the handling of the pullet or the action of the serum brought about a physiological disturbance which was responsible for this yolk.

The constancy of hatching power in hens, H. M. Hyre and G. O. Hall (*Poultry Sci., 11 (1932), No. 3, pp. 166–171*).—The purpose of this study at the New York Cornell Experiment Station was to find out if there was any relation between the percentage of fertile eggs hatched by pullets or yearling hens and the hatching powers during successive years, and to determine whether any changes occur in the hatchability, whether from hens high or low in hatching power, due to age.

The results indicated that the hatching power of the domestic fowl behaved as an individual characteristic which was fairly constant from year to year. The hatching power decreased slightly with age, and appeared to be more constant in the White Leghorns studied than in the heavy breeds. The records of four or five hatching seasons showed less correlation between different years than did the records for only two or three seasons. The range of variability in this power increased with age.

Fertility also behaved as an individual characteristic, with a fair degree of constancy from year to year, and decreased slightly with age. The range in variability of fertility was slightly less for the fourth year than it was for the second and third years. There was no correlation between fertility and hatchability.

The production of table ducklings, V. K. Tallent (*Harper Adams Util. Poultry Jour., 17 (1931–32), No. 8, pp. 357, 358*).—A comparison of barley meal and Sussex ground oats as feeds for fattening table ducklings at the National Institute of Poultry Husbandry showed that while both feeds were equally effective in finishing the birds, the barley meal was more economical and hence showed a slightly greater margin of profit.

Rickets in young turkeys, H. M. Scott, J. S. Hughes, and H. W. Loy (*Poultry Sci., 11 (1932), No. 3, pp. 177–180, fig. 1*).—A comparison of poults and chicks receiving a ration low in the antirachitic factor was made at the Kansas Experiment Station. Bone analyses were made of the femur and tibiae bones of representative birds at the beginning and at each succeeding 2-week period during the 8 weeks of the test. One lot of each kind of birds was irradiated daily, while the other lot received only the basal ration.

The turkey poults developed characteristic symptoms of rickets in a shorter time than did the chicks under identical conditions. During this test the chicks did not develop the advanced stage of rickets observed in the nonirradiated poults. In poults rickets are characterized by awkward movements, soft beaks, and ruffled appearance of the feathers. The femur and tibiae bones of rachitic poults were low in ash, and the blood had a low calcium and inorganic phosphorus content.

Dressing and packing turkeys for market, T. W. Heitz (*U. S. Dept. Agr., Farmers' Bul. 1694 (1932), pp. II+29, figs. 14*).—Suggestions are given for the best methods of selecting, killing, dressing, and marketing turkeys in order to get the greatest financial returns.

DAIRY FARMING—DAIRYING

[Experiments with dairy cattle], C. D. Grinnells (*North Carolina Sta. Rpt. 1931, pp. 62–64, 65, 66*).—This report includes progress data on pasture

management for dairy cattle, the value of lespedeza as a supplementary pasture, dairying as a supplementary enterprise to cotton farming, dairy refrigeration studies, and the value of fly repellents in maintaining summer milk production.

[**Experiments with dairy cattle and dairy products**] (*Pennsylvania Sta. Bul. 279 (1932), pp. 8–10, 13*).—Data on the progress of studies with dairy cattle include the nutritional value of cottonseed meal and sun-cured v. dehydrated roughages for dairy heifers, by S. I. Bechdel and P. S. Williams, and the vitamin D requirements of dairy calves, by Bechdel and K. G. Landsburg.

In studies with dairy products data are reported on the use of dried skim milk in making ice cream, by C. D. Dahle and C. C. Walts, the cause of certain off flavors in ice cream, by Dahle and E. C. Folkers, and studies on cream line formation.

Comparison of conformation, anatomy, and skeletal structure of the cow and bull of a dairy breed, W. W. Swett, R. R. Graves, and F. W. Miller (*Jour. Agr. Research [U. S.], 45 (1932), No. 11, pp. 641–674, figs. 17*).—Results with a beef and a dairy cow (E. S. R., 60, p. 758) suggested the advisability of making a similar comparison of a cow and a bull of the same breed. A Jersey bull and cow typical of their breed were subjected to ante- and post-mortem examination and measurements.

There was considerable difference in the external conformation of the bull and the cow. The most marked of these were in widths and circumferences of the body and in general heaviness in the anterior parts. There was little difference in depths of body, and in the measurements which indicate "scale" they were practically the same. The apparent differences in conformation were due largely to the "crest" of the bull which is partly skeletal but mostly muscular, to the low front chest development which is partly due to the low position of the anterior end of the sternum bone but largely to the abundance of loose skin, and to the fact that the head of the bull is much broader than that of the cow. The tendency for the bull to appear light in the flank is partially due to the relatively heavy fore quarter and partially to the fact that there is no udder to carry the underline on a downward slope.

Of the internal organs only the thyroid and spleen were proportionately larger in the bull than in the cow. The greatest differences in skeletal structure appeared in the cervical vertebrae and in the size and shape of the pelvis. The differences which existed in the internal anatomy and skeletal structure were to a great extent due to differences in muscular development and fleshing.

Judging dairy cattle, J. B. Fitch and H. J. Brooks (*Kansas Sta. Circ. 167 (1932), pp. 47, figs. 21*).—This publication was prepared to assist in establishing dairy type in the mind of the beginning dairyman or student. The value of judging, a comparison of beef and dairy type, and the characteristics of a good dairy cow are discussed. A general score card for dairy cows, as well as breed score cards, are included.

[**Fertility in dairy cattle**], J. W. Gowen and W. F. Dove (*Maine Sta. Bul. 360 (1931), pp. 170–172*).—Data are reported on the percentages of total services which resulted in pregnancy as related to the season of the year and age of dam.

Twenty years of experience with dairy sires, J. B. Fitch and H. J. Brooks (*Kansas Sta. Circ. 166 (1932), pp. 42, figs. 28*).—The ability of bulls of the four major dairy breeds to influence the production of a herd, based on records maintained over a period of 20 years at the station, is discussed.

Nitrogen dressing of dairy pastures, A. W. Hudson and J. W. Woodcock (*New Zeal. Jour. Agr., 42 (1931), No. 2, pp. 99–115*).—Results of 74 trials in the 1928–29 season and 84 trials in the 1929–30 season indicated that the average

gain for the two seasons for each 100 lbs. of nitrogenous manure on the pastures was 16 lbs. of butterfat. When the fertilizer was applied in late winter there was an average increase of 20 cow days per acre, and when applied in the autumn the increase was 13.3 cow days per acre. Pastures of naturally high production and containing a fair proportion of the better grasses were more responsive to nitrogen fertilizer than fields of lower production. The nitrogen appeared to give better results when a phosphate dressing was applied at the same time or within a few weeks of the early nitrogen application.

Apparent digestibility of, and nitrogen, calcium, and phosphorus balance of dairy heifers on, artificially dried pasture herbage, R. E. Hodgson and J. C. Knott (*Jour. Agr. Research [U. S.], 45 (1932), No. 9, pp. 557–563*).—In cooperation with the Washington Experiment Stations, the U. S. D. A. Bureau of Dairy Industry made a study of the apparent digestibility of artificially dried pasture grasses. The herbage was obtained from plats of pure stands of the following grasses and clovers: English ryegrass, Italian ryegrass, orchard grass, rough-stalked meadow grass, Kentucky bluegrass, annual bluegrass, meadow fescue, creeping bent, ladino clover, alsike clover, and white clover. The grasses were cut with a lawn mower and dried by passing air heated to from 100 to 200° F. through an oven until the material reached approximately 5 per cent moisture. The material was cut into 3-in. lengths and mixed, and the predominating plants in the resulting mixture were English and Italian ryegrass. The dried material was fed to three Holstein heifers through a 10-day preliminary period and a 15-day collection period.

Crude protein, which made up 24.6 per cent of the dry matter, had an average digestibility coefficient of 74.9 per cent. The nitrogen-free extract was 74.6 per cent digestible. The average digestibility of ether extract was only 21.9 per cent, and it was thought that this low coefficient might be due to the drying process. Crude fiber was found to be 72.7 per cent digestible.

The nitrogen balances were negative with two of the three cows and showed an average negative balance of 0.63 g daily. The calcium balances were positive in two cases, showing a daily retention of 1.9 and 2.04 g, respectively, while in the third case there was a negative balance of 21.9 g daily. The first two animals had positive phosphorus balances of 2.6 and 1.5 g daily, while the last animal had a negative balance of 0.5 g daily. The average daily intake of calcium and phosphorus was 45.6 and 38.3 g, respectively.

Studies on milk secretion, J. W. Gowen and E. R. Tobey (*Jour. Gen. Physiol., 15 (1931), No. 1, pp. 45–66, figs. 13; abs. in Maine Sta. Bul. 360 (1931), p. 216*).—Since most of the original constituents of milk find their origin in the blood stream, the authors believed that any means of altering the chemical characteristics of the blood would be expected to affect the characteristics of the milk secreted. The study was undertaken by the Maine Experiment Station in cooperation with the Rockefeller Institute for Medical Research to determine the effect of withholding all food but allowing free access to water. The yield and composition of milk were analyzed at various times during the periods of starvation.

It was found that milk showed changes in composition which were progressive in that they followed a definite course. The changes consisted of a decrease in the amount of milk produced; an increase in total solids, chiefly fat and ash, with a slight increase in proteins; and a pronounced decrease in lactose. The last change corresponded with a decrease in the dextrose content of the blood, supporting the conclusion that dextrose of the blood is a precursor of lactose in the milk. All these changes in the milk could be directly related to simultaneous changes in the blood.

On the mechanism of milk secretion, J. W. Gowen and E. R. Tobey (*Jour. Gen. Physiol., 15 (1931), No. 1, pp. 67–85, figs. 8; abs. in Maine Sta. Bul. 360 (1931), pp. 216, 217*).—Continuing the above study, insulin was introduced into the jugular vein of cows that were on feed and those that were being starved. The immediate effect was to cause a sharp drop in milk production which was more pronounced than was the drop for starvation. The effect of insulin wore off more rapidly when the cows were on feed than when on starvation. The total solids of the milk, the butterfat percentage, and the percentage of ash in the milk rose rapidly after the introduction of insulin. The nitrogen content behaved irregularly, while the change in percentage of lactose was a sharp drop. The results of the work with insulin were in agreement with those on inanition in showing that the osmotic pressure of the blood was a leading factor in stabilizing the concentration of solids found in milk.

The introduction of phloridzin into the jugular vein of a cow on starvation was accompanied by a decrease in milk production. The decrease followed essentially the curve of starvation and did not appear to represent any particular effect of the phloridzin. The total solids of the milk and the butterfat percentage increased somewhat for a time, subsequently decreased, and rose again after the fourth introduction of phloridzin. The ash content rose in a comparable manner but at a slightly lower rate than that which occurred in starvation. The nitrogen content of the milk was lower than that noted for starvation. The drop in lactose was sharply marked at the end of the test when the reserved body sugar had been depleted. Phloridzin depleted the blood sugar to a limited degree and markedly increased the nitrogen and dextrose eliminated in the urine.

These studies gave direct proof that modifications of the blood of dairy cows produced direct and predictable modifications in the milk secreted.

Quality, size, capacity, gross anatomy, and histology of cow udders in relation to milk production, W. W. Swett, F. W. Miller, R. R. Graves, and G. T. Creech (*Jour. Agr. Research [U. S.], 45 (1932), No. 10, pp. 577–607, pls. 12*).—Continuing the study of the cow's udder by the U. S. D. A. Bureau of Dairy Industry (E. S. R., 68, p. 371), the purpose of this paper was to discuss the quality, size, and general characteristics of amputated udders; to describe and illustrate their gross and microscopic anatomy; to demonstrate that not only is milk stored in the udder, but that the udder capacity is greater than the quantity produced at one milking; and to show the relationship of udder characteristics to the demonstrated producing ability of the cow. Ante-mortem examinations were made on more than 250 cows, both before and after milking, while both ante- and post-mortem examinations were made of the udders of 11 cows. While more than 30 items were observed at each ante-mortem examination, only looseness of udder, "yieldability," softness and mellowness of gland tissue, abundance of fiber, and average free space were considered significant in relation to "quality of udder."

The empty weight of the udders studied varied from 23.3 to 54.2 lbs., averaging 37 lbs., while the average capacity for the 11 udders was 50.1 lbs. The relation of capacity to weight of udder was an index of the udder's fluid-holding capacity for each unit of empty weight and should indicate its porosity. The percentages showing this relationship averaged 142.4. There appeared to be a positive correlation between udder quality and post-mortem recovery of milk, while there seemed to be a more or less negative correlation between udder quality and size (empty weight) of udder. In the group of udders studied udder quality was apparently not associated with udder capacity. On the other hand, udder quality appeared to be positively associated with the relation of capacity to weight of udder.

A significant negative correlation existed between the size of udder and the post-mortem recovery of milk. Post-mortem recovery did not appear to be associated with capacity, but was fairly definitely associated with relation of capacity to weight of udder. Post-mortem recovery was not materially affected by the ante-mortem level of production at time of slaughter. Size and capacity of udder were not definitely correlated, small udders having a greater capacity per unit of weight than large ones. Breed characteristics seemed to have little effect on the results obtained in connection with udder quality, post-mortem recovery, or size of udder, but had some effect on results based on udder capacity. The stage of lactation did not appear to be associated with any of these factors. The relative size of cistern was positively and fairly definitely correlated with free space, was negatively correlated with size, and had only moderate or insignificant correlations with other characters. The porosity of the gland tissue was not correlated with udder quality or other udder characteristics. The relative abundance of the connective tissue visible in the gross anatomy was positively and fairly definitely correlated with the abundance of fiber which was graded ante-mortem, but was not correlated with other udder characteristics. The possibility of predicting the gross structure of the udder from the ante-mortem examination appeared to be limited.

The producing ability of the cows appeared to be moderately correlated with size and distinctly correlated with capacity, but showed no relation to other udder characteristics. Little relationship was found between numerical ratings designed to give credit for the cow's efficiency and udder characters. A histological study was made of the 11 udders, and the findings could all be accounted for when consideration was given to the history of the case.

The effect of different planes of protein intake upon milk production, E. S. Harrison and E. S. Savage (*New York Cornell Sta. Bul. 540 (1932), pp. 24, figs. 13*).—Concluding this study (E. S. R., 66, p. 662), which was begun in 1928, it was found that a concentrate mixture containing 16 per cent of total protein, when fed with No. 2 medium timothy-clover mixed hay and corn silage, gave as high milk production when fed at the rate of 1 lb. of concentrates to 3.5 lbs. of milk as grain mixtures containing either 20 or 24 per cent of total protein. After 0.7 lb. of digestible protein per 1,000 lbs. live weight was deducted for maintenance the 16 per cent mixture returned 127.8 per cent of the protein in the milk, and this amount of protein proved adequate for efficient and economical milk production. There was no difference in the utilization of the total digestible nutrients in the three groups, nor was there any evidence of a stimulating effect by protein on milk secretion.

Effect of condimental stock food tonics on milk production, G. E. Taylor and E. L. Anthony (*Michigan Sta. Quart. Bul., 15 (1932), No. 2, pp. 118–127, figs. 2*).—Two tests were conducted with one of the leading stock food tonics to demonstrate the value of such tonics when fed as a supplement to a balanced dairy ration. The tonic was fed according to the directions of the manufacturer.

It was found that the tonic had no influence on milk production, but that it did increase the cost of production. The tonic was not palatable, decreased feed consumption somewhat, and when fed according to directions caused the animals to go off feed and produced bloating in some cases. The animals fed the tonic showed no signs of improved health or general vigor and gained less in weight than the animals fed the basal ration. On the basis of these tests the feeding of a stock food tonic as a supplement to a well balanced ration could not be recommended.

The effect of corn oil on milk and butter fat production and on the composition of butter fat in the dairy cow, T. S. Sutton, J. B. Brown,

and E. W. JOHNSTON (*Jour. Dairy Sci., 15 (1932), No. 3, pp. 209–211*).—Continuing this series of studies (E. S. R., 65, p. 663), a Holstein cow in her ninth month of lactation was fed, in addition to silage and alfalfa hay, 5 lbs. of a basic grain ration and 2.25 lbs. of starch for 8 days. During the next 16 days 1 lb. of corn oil was substituted for the starch. Following this period the control diet was resumed. Samples of milk were tested for butterfat, and the butterfat was recovered and analyzed.

Feeding the corn oil had no significant effect upon the milk or butterfat production, but during the period when it was fed the fatty acids of the butterfat were more unsaturated, had a higher mean molecular weight, and the content of volatile soluble acids was reduced.

The functional relation of yearly feed cost and butterfat production in dairy cattle, R. E. HODGSON (*Jour. Dairy Sci., 15 (1932), No. 3, pp. 212–219, figs. 4*).—The data used in this study by the U. S. D. A. Bureau of Dairy Industry were obtained from 10,000 individual Dairy Herd Improvement Association records, selected at random for cows generally distributed over the State of Wisconsin during 1926 to 1928, inclusive. The records were classified for feed cost and butterfat production, and all records of less than 8 months' duration were discarded.

A correlation of 0.5390 ± 0.0048 was found to exist between yearly feed cost and butterfat production. The results indicate that in the groups studied a unit increase in production was associated with a proportionately smaller increase in feed cost. The cost of producing 1 lb. of butterfat decreased as production increased.

Sediment in homogenized milk, G. M. TROUT and C. P. HALLORAN (*Michigan Sta. Quart. Bul., 15 (1932), No. 2, pp. 107–110, figs. 3*).—A study was undertaken to determine the cause of a smudgy, dirty deposit in bottled homogenized milk. This defect appeared after from 24 to 48 hours in the bottle.

Various pressures of homogenization showed no consistent differences in the amount of deposit, and filtering the milk through two thicknesses of filter cloth did not prevent the appearance of the sediment. Hand-clarified, homogenized milk showed this defect to a less intense degree, while power-clarified milk showed no defect after 24 hours, a trace at 48 hours, and considerable sediment after 72 hours.

The sediment appeared to be very fine dirt, probably in a mixture with some milk solids. In order to keep this defect at a minimum it is recommended that extreme cleanliness during production and subsequent handling be observed. Refrigeration also retarded the formation of the sediment.

The detection of inefficiently pasteurized milk based on a modification of the new Rothenfusser test, B. S. GOULD (*Jour. Dairy Sci., 15 (1932), No. 3, pp. 230–241*).—In this article the author describes a method by which as little as 1 per cent of raw milk in pasteurized milk can be detected, and which also can be used to detect small amounts of slightly underpasteurized milk in pasteurized milk. The test is not easily affected by bacterial action, and in actual commercial application has given very satisfactory results in the detection of inefficient pasteurization.

The margin of safety between the thermal death point of the tubercle bacillus and the thermal cream layer volume impairment in pasteurizing milk at various temperatures, A. C. DAHLBERG (*New York State Sta. Tech. Bul. 203 (1932), pp. 10, fig. 1*).—The results of this study show a definite correlation between the periods of time and various temperatures that are required to destroy the tubercle bacillus in milk. This relationship can be represented as a straight line on a semilogarithmic graph, and the same relationship held for the maximum temperature to which milk could be exposed without affecting

creaming (E. S. R., 65, p. 866). As a result of this definite correlation between the thermal death period of tubercle bacillus and the thermal cream layer impairment time it was possible to establish comparable pasteurization standards from 140° to 160° F., together with margins of safety for public health and for good creaming. The margins of safety were greatest at the lower pasteurizing temperatures.

Irradiated milk: The amount of vitamin D and its rate of formation, G. C. Supplee, Z. M. Hanford, M. J. Dorcas, and H. H. Beck (*Jour. Biol. Chem., 95 (1932), No. 2, pp. 687–697, figs. 2*).—Continuing studies previously noted (E. S. R., 68, p. 373) the authors found that up to certain limits the degree of antirachitic potency that could be imparted to milk bore a direct relationship to the amount of energy applied. Beyond these limits additional energy did not increase the vitamin D content proportionately. The rate of vitamin D formation and the quantum efficiency of the reaction was greatest during the very early stages of the process. The maximum concentration of vitamin D was found after approximately 2,500,000 ergs per cubic centimeter had been applied to the milk. This concentration was approximately 12 times that of nonirradiated milk. Carbon arcs and quartz mercury vapor arcs were capable of producing essentially the same vitamin D concentration when comparable amounts of energy were applied. The results show that the sources of radiation that emit the greatest amount of energy per unit of time were the most efficient for irradiating milk under the conditions of this study.

Observations on the quantitative changes in the microflora during the manufacture and storage of butter, H. Macy, S. T. Coulter, and W. B. Combs (*Minnesota Sta. Tech. Bul. 82 (1932), pp. 36*).—This study was undertaken to evaluate the importance of the various materials, equipment, and processes involved in the manufacture of butter as sources of molds, yeasts, and bacteria in the finished product. Consideration was given to the distribution of microorganisms during the process of butter making, the seasonal variation in the number of organisms in the raw cream, and the efficiency of pasteurization. Observations were made on the changes in the number of microorganisms in both salted and unsalted butter during storage. Mold, yeast, and bacterial counts were made of the raw cream; the cream after pasteurizing and cooling; the cream in the churn; the buttermilk; the butter; the rinsings from pipes, pumps, and churns; the rinse water; salt; air; and the parchment liners and circles used in the butter tubs. The counts were made on the two types of butter after 30 days' and 9 months' storage at 35° F. The studies were continued for a period of one year, and the results are based on 45 different churnings.

A seasonal variation in the number of microorganisms in raw cream was observed. Pasteurization was found to destroy 100 per cent of the molds, 89 to 100 per cent cent of the yeasts, and 94 to 99.9 per cent of the bacteria. The most prolific source of contamination of cream and butter, especially for molds and yeasts, was the churn. Pipes, pumps, salt, parchment paper, and air were not serious sources of infection. There was a noticeable tendency for unsalted butter to increase in mold, yeast, and bacterial counts during storage, while most of the salted butters showed decreasing counts during this period. The effect on yeast and bacterial counts was more marked as the salt content of butter increased, but the mold counts were not always so affected.

The correlation between the organisms found microscopically and the bacteriological deterioration of butter, J. A. Nelson (*Montana Sta. Bul. 267 (1932), pp. 27*).—This study was undertaken to determine whether or not it was possible to predict the keeping quality of butter with reasonable accuracy by a microscopic study of the flora, and was carried on at the Iowa Experiment Station. A total of 303 samples of commercial salted butter, 93 of commercial

unsalted butter, and 53 of exhibition butter were scored for flavor and aroma when received. Microscopic slides were made from the samples, they were also plated on beef infusion agar, after which the samples were placed in an incubator at 21° C. for 7 days. The keeping quality was predicted from a study of the slides and again before the samples were rescored after the holding period.

It was found that the types and numbers of rods present appeared to be an index to keeping quality. Clumps of well stained, thin rods were almost always a sign of deterioration, particularly in unsalted butter. With 96.4 per cent of the commercial salted samples, 79.6 per cent of the unsalted, and 84.9 per cent of the exhibition samples, it was possible to predict rather accurately their keeping qualities from the types, appearance, and numbers of organisms. The most common defects encountered were protein decomposition, cheesiness, and putridness. Whenever these defects occurred a large number of the small thin rods were present on the microscopic slides made after the holding period. While deterioration did not always follow the growth of microorganisms at the incubating temperature, the appearance of the thin rods usually resulted in deterioration.

The microscopic counts were always higher than the plate counts, but there was no definite correlation between them. There appeared to be no correlation between plate counts and keeping quality, and the original flavor score did not appear to be correlated with keeping quality. Salt had a definite inhibiting effect on the development of microorganisms at the incubating temperature used.

Development of the Escherichia-Aerobacter group of bacteria in butter, B. W. Hammer and M. W. Yale (*Jour. Dairy Sci., 15 (1932), No. 3, pp. 199–208*).—A study was undertaken at the Iowa Experiment Station to determine the relationship of the Escherichia-Aerobacter group of bacteria to butter from the standpoint of (1) growth in butter under favorable temperature conditions and (2) influence on the odor and flavor of butter. The cream used in the study was pasteurized, and after cooling it was inoculated with a culture of an identified organism just previous to churning. Each churning of butter was divided into two lots, one of which was salted and the other left unsalted. Samples of butter were plated as soon as it was made and after 2, 5, and 10 days. Of the 25 cultures of the group that were used in the study after being isolated from 17 samples of off-flavored butter, 15 cultures were *A. aerogenes*, 4 *A. cloacae*, 3 *A. oxytocum*, and 3 belonged to the intermediate genus Citrobacter.

When examined after 10 days' storage it was found that at 7° C. Escherichia species did not grow in salted butter but that some did grow in unsalted butter, while Aerobacter species regularly grew in unsalted butter and sometimes in salted butter. At 18° both species grew in salted and unsalted butter, but the Aerobacter species grew more rapidly and reached higher numbers than the Escherichia species. When stored at 7 and 18° the Escherichia species did not produce off flavors or odors in either type of butter, while the Aerobacter species sometimes caused off flavors and odors in unsalted butter at 7° and regularly produced off flavors and odors in both butters at 18° The odor and flavor produced by the Aerobacter species resembled the condition produced in milk by this species. From 2.9 to 20 per cent of the organisms of this group present per milliliter of cream were retained per milliliter of fresh unsalted butter. The ratio of microscopic counts to the numbers of organisms of the group according to the eosin-methylene-blue counts in butter made from inoculated cream varied from 1 to 1 to 18.4 to 1.

The influence of certain lactic acid streptococci on the chemical changes in Cheddar cheese during ripening, C. D. Kelly (*New York State Sta. Tech.*

Bul. 200 (1932), pp. 28, figs. 3).—The purpose of this study was to obtain information on the function of the starter organism and to study the rate of chemical change in Cheddar cheese during ripening. For the experiment six commercial cheeses and a number of cheeses made with pure cultures of *S. lactis* and *S. cremoris* were studied. Determinations were made of the protein fractions soluble in water, trichloracetic acid, and phosphotungstic acid, as well as for amino nitrogen by the Van Slyke method.

An increase in all the fractions determined showed a steady breaking down of the proteins. The amount of nonprotein nitrogen as determined by the portion soluble in trichloracetic acid was never more than 24 per cent of the total nitrogen in the ripe cheese. This fact showed that protein hydrolysis, contrary to the usual belief, is far from complete. Little change was noted during the first 10 to 13 days of the ripening period, except in the protein fraction soluble in water. During this period the milk sugar was destroyed and bacteria made their last increase in numbers. The number of bacteria increased to as many as 100,000,000,000 per gram of cheese at about 10 days, followed by the rapid death of the organisms. It was believed that the increase in protein digestion at the end of 10 days was closely associated with the rapid destruction in bacteria.

In the cheeses made with *S. lactis* and *S. cremoris* the proteins went through changes similar to those found in commercial cheese. There was no difference in the cheeses made with the pure culture starters. These results indicated that the important function of a starter is acid production and that it has little direct influence on the flavor or aroma.

Lactic acid streptococci associated with the early stages of Cheddar cheese ripening, C. D. Kelly (*New York State Sta. Tech. Bul. 201 (1932), pp. 26*).—This investigation was planned to determine whether the aroma of starters was important in the manufacture of cheese or whether their use was mainly for the production of acid. Bacterial counts were made at intervals on the cheeses in the above study, and colonies were isolated to determine the more common types present.

While cheese made with *S. cremoris* had a better flavor and aroma during the process of manufacture and the early stages of the ripening period, little difference was noted between this cheese and that made with *S. lactis* when the two were ready for consumption. *S. lactis* was found to be the predominant organism in commercial cheese, 49 per cent of the cultures isolated from these cheeses being classified as such, while only 9 per cent were found to be *S. cremoris*. When starters of pure cultures of streptococcus were used, the organisms did not necessarily predominate in the cheese, being practically the same as in commercial cheese. These results indicate that the important feature of a cheese starter is the production of acid, and that satisfactory Cheddar cheese could be made with cultures of either *S. lactis* or *S. cremoris*.

The strains classified as *S. lactis* and *S. cremoris* are discussed, and it is pointed out that because of variations in action on certain carbohydrates it is not desirable to make separate species of these strains.

Ripening cheese in a sealed package, L. A. Rogers (*Jour. Dairy Sci., 15 (1932), No. 3, pp. 185–189, figs. 2*).—In this paper from the U. S. D. A. Bureau of Dairy Industry a method is described for canning Cheddar cheese direct from the press. The important feature of this process is a valve which permits the escape of the gases formed during the ripening period without allowing air to enter. In such a package cheese ripens normally without loss of mois-

ture, formation of rind, or growth of mold. The added expense of the process is largely offset by elimination of loss through evaporation, the necessity of paraffining, and the care of the cheese in the curing room.

VETERINARY MEDICINE

A compendium of histopathology of the domestic animals, L. Lund (*Grundriss der Pathologischen Histologie der Haustiere. Hannover: M. & H. Schaper, 1931, pp. XII+471, figs. 311*).—The first part of this work, consisting of a general discussion (pp. 1–22), is followed by the special part (pp. 23–453), which deals, respectively, with the blood and blood-forming organs, organs of circulation, of respiration, and of digestion, the genito-urinary organs, organs of locomotion, the skin, central nervous system, ductless glands, and tumors. A seven-page list of references to the literature is included.

Compendium of special pathology and therapy for veterinarians, E. Fröhner and W. Zwick (*Kompendium der Speziellen Pathologie und Therapie für Tierärzte. Stuttgart: Ferdinand Enke, 1932, 4. ed., rev., pp. VIII+358; rev. in Cornell Vet., 22 (1932), No. 3, p. 292*).—In this edition of a work first issued in 1912, the organic diseases are dealt with by Fröhner in the first 164 pages and followed by the infectious diseases by Zwick.

Index-catalogue of medical and veterinary zoology.—Part I, Authors: Aall to Azzolina, A. Hassall and M. Potter (*U. S. Dept. Agr., 1932, pp. 142*).—This is a revision and continuation of the Index-Catalogue of Medical and Veterinary Zoology published in 1902–1912 under the authorship of Stiles and Hassall, last noted in 1912 (E. S. R., 26, p. 753).

[Contributions on comparative pathology] (In *2. Congrès International de Pathologie Comparée, Paris, 1931. Paris: Soc. Path. Compar., [1932], vol. 2, pp. 235–239, 274–277, 285–287, 301–303, 614–616, 619–624*).—Among the contributions presented at the Second International Congress of Comparative Pathology, held in Paris in October, 1931, are the following: Vaccination of the Calf and Hog of Holland Race Against Tuberculosis by B. C. G., by L. de Blieck (pp. 235–238); Immunization of the Rabbit by B. C. G., by F. Neri and S. Cramarossa (p. 239); The Brucelliases of Man and Animals, by J. van der Hoeden (pp. 274–277); Investigations of Milk of Cows Infected by Brucella Bang, by L. F. D. E. Lourens (pp. 285–287); The Serological Differentiation of "*Br[ucella] abortus*" and "*Br. melitensis*," by G. S. Wilson and A. A. Miles (pp. 301–303); Comparative Studies of Antitoxin Immunity in the Reptiles, by E. Grasset (pp. 614–616); On the Spontaneous Pathogenicity of *Bacillus suipestifer* for Man and Other Species Than Swine, Particularly the Silver Fox and the Chicken, by C. Cernaianu (pp. 619–622); and Contribution to the Study of the Transmission of Nosema with *Apis mellifica*, by R. Moreaux (pp. 622–624).

[Work in animal pathology and parasitology] (*North Carolina Sta. Rpt. 1931, pp. 55, 64, 113–115, 118*).—The work here briefly referred to includes data on control of stomach worms by sanitation at the central station and by drenching at the Piedmont Substation, by E. H. Hostetler; bovine infectious abortion, by C. D. Grinnells et al.; avian typhoid studies; and studies of intermittent reactors to pullorum disease; together with a tabulated classification of causes of poultry mortality.

Importance of disease in wild-life administration, J. E. Shillinger (*Jour. Amer. Vet. Med. Assoc., 81 (1932), No. 5, pp. 601–609, figs. 7*).—A contribution presented at the annual meeting of the American Veterinary Medical Association held in Atlanta, Ga., in 1932.

Interim report on the immunisation of draft animals in Burma against anthrax, D. T. Mitchell (*Burma Vet. Dept. Bul. 1 (1930), pp. 11*).—The vaccination work against anthrax of the three species of draft animals, elephants, cattle, and buffaloes, has given very promising results in both laboratory and field experiments.

Infectious bulbar paralysis (Aujeszky's disease) [trans. title], A. Burggraaf and L. F. D. E. Lourens (*Tijdschr. Diergeneesk., 59 (1932), No. 16, pp. 981–1002; Ger., Eng., Fr. abs., pp. 998–1002*).—A description is here given of infectious bulbar paralysis as observed on different farms in the vicinity of Bodegraven, Netherlands.

The treatment of ascariasis and trichuriasis with hexylresorcinol pills, H. W. Brown (*Amer. Jour. Hyg., 16 (1932), No. 2, pp. 602–608, figs. 5*).—The administration of hexylresorcinol pills has been found to be quite effective in the treatment of ascariasis.

The viability of Brucella abortus, H. S. Cameron (*Cornell Vet., 22 (1932), No. 3, pp. 212–224*).—This is a report of studies to determine the tenacity of *B. abortus*, conducted at the experiment station of the New York State Veterinary College at Ithaca and presented in connection with a review of the literature, 12 references to which are included.

The work has shown that this organism lives "4½ hours when exposed to direct sunlight; 5 days when dried in burlap sacking kept on a laboratory table; 30 days when dried in burlap sacking kept in an unheated cellar; 121 days, the maximum interval covered, when dried in the presence of nutrient material; 72 days when dried in the absence of nutrient material; less than 4 days in soil which dried quickly in Petri dishes placed in an unheated cellar during October; 27 days, the maximum interval covered, in soil treated in the same manner as in the preceding experiment but conducted during February; 37 days in soil that dried slowly in test tubes kept in a laboratory cupboard; 66 days, the maximum interval covered, after having been in wet soil stored in an unheated cellar; 4 days in normal bovine urine at room temperature; 120 days in bovine feces kept in test tubes in a laboratory cupboard and dried very slowly; 100 days in bovine feces which were kept in an unheated cellar and did not dry; 77 days, the maximum interval covered, in the presence of putrefaction; 77 days in tap water which was sterilized before the organism was introduced and kept at room temperature; [and] 114 days in tap water kept at a temperature approximating —°4 C."

The diagnosis of Johne's disease—some experimental results using a "bowel-washing" method, H. Cooper and M. K. Srinivasan (*Indian Jour. Vet. Sci. and Anim. Husb., 1 (1931), No. 3, pp. 215–220*).—It is pointed out that while the avian tuberculin test is the most satisfactory test that has thus far come into use for the diagnosis of Johne's disease in the early stage, in cases where a positive reaction to avian tuberculin is obtained, or where animals are suspected to be clinically affected with the disease, it is desirable to obtain confirmation of the diagnosis by the actual demonstration of the causative organism. In the discussion the authors deal with the results obtained through the use of the bowel-washing method, the details being given in tabular form.

The identity of streptococci of animal origin with certain strains of Str. epidemicus, P. R. Edwards and W. W. Dimock (*Science, 76 (1932), No. 1961, pp. 107, 108*).—Work at the Kentucky Experiment Station here reported has shown that, by the methods now in use, it is not possible to differentiate the cultures of *Streptococcus epidemicus* of human origin from streptococci of animal origin. The group of animal strains which the authors have studied is composed of cultures isolated from horses, chickens, hogs, cows, and foxes.

This type is the predominant one in animals and, with the exception of the high acid producing strains from bovines and *S. equi* of strangles, comprises approximately 95 per cent of the hemolytic streptococci of animal origin which they studied.

A comparison of the effects of viosterol in acute experimental avian and bovine tuberculosis, T. D. Spies and T. T. Walker (*Amer. Rev. Tuberc., 24 (1931), No. 6, pp. 723–728*).—The authors have found that "the administration of repeated large doses of viosterol to guinea pigs with acute avian tuberculosis causes little or no increase in the calcification of the lesions or within the otherwise normal parenchyma of certain organs. This degree of calcium deposition is very much less marked than that which occurs in acute bovine tuberculosis under the same conditions."

Endemic typhus fever of the United States: History, epidemiology, and mode of transmission, R. E. Dyer, L. F. Badger, E. T. Ceder, and W. G. Workman (*Jour. Amer. Med. Assoc., 99 (1932), No. 10, pp. 795–801*).—In reviewing the present status of knowledge of this disease in connection with a list of 75 references to the literature, the authors deal with the work relating to its transmission by insects. It is thought that the oriental rat flea is the common vector of endemic typhus in this country

On the anatomy and systematic position of the causative agent of so-called salmon poisoning, G. Witenberg (*Jour. Parasitol., 18 (1932), No. 4, pp. 258–263, fig. 1*).—The author reports that a reexamination made in Palestine of American material at his disposal showed that anatomical details in *Nanophyetus salmincola* are more variable than mentioned by Chapin (E. S. R., 55, p. 176) and others, and that *N. schikhobalowi* is identical with *N. salmincola.* A description is given by the author of *N. salmincola* obtained in America from experimental dogs. He is of the opinion that the genus Nanophyetus corresponds exactly to the genus Troglotrema Odhner 1914, of the family Troglotrematidae Braun 1915, and should be regarded as a synonym, the name thus being *T. salmincola.*

The relation of meat and meat products to bacterial food poisoning in man, [II], R. Lovell (*Vet. Rec., 12 (1932), No. 36, pp. 1052–1065*).—The author concludes (E. S. R., 67, p. 599) that bacterial food poisoning in man may be due to Salmonella bacteria, the preformed toxin of *Clostridium botulinum,* staphylococci, or, occasionally, comparatively harmless bacteria if present in the food in sufficiently large numbers. As the majority of cases of food poisoning occurring in England are considered to be due to the Salmonella bacteria, the methods of infection of the food with these bacteria are discussed.

A list is given of 40 references to the literature.

Observations on the toxicity of golden glow (Rudbeckia laciniata) to swine and other animals, L. V. Skidmore and N. F. Peterson (*Jour. Amer. Vet. Med. Assoc., 81 (1932), No. 5, pp. 655–662, figs. 2*).—In this contribution from the Nebraska Experiment Station experimental feeding of swine, sheep, cavies, and rabbits on goldenglow, a widely distributed plant growing along the banks of streams and in moist places, is reported upon. Some of the rabbits and guinea pigs were killed by its consumption, but it was only when they were deprived of their food that they would consume it in sufficient quantities to produce toxic effects. Microscopic examination of the organs of four of the five rabbits and cavies which died showed fatty degeneration of the liver and pneumonia.

Johnson grass (Sorghum halepense) poisoning, F. P. Mathews (*Jour. Amer. Vet. Med. Assoc., 81 (1932), No. 5, pp. 663–666*).—This contribution from the Texas Experiment Station on work conducted cooperatively with the U. S. D. A. Bureau of Animal Industry gives seven case reports of poisoning

by Johnson grass. Important losses of cattle through consumption of this grass frequently occur in Brewster and Presidio Counties, having thus far been confined to late spring and early summer months. It is said that a period of drought, varying from days to weeks, has preceded every outbreak of poisoning.

A bacteriological study of the gravid and nongravid bovine uterus, C. P. Fitch and L. M. Bishop (*Cornell Vet., 22 (1932), No. 3, pp. 225–238*).—In work at the Minnesota Experiment Station, "126 uteri were studied. Eighty-one were gravid and ranged in gestation from 30 days to approximately full term. Forty-five were nongravid uteri, 20 of which were probably virgin. Sixteen uteri were classified as sterile because the number of colonies obtained from all cultures did not exceed three. If these were considered as contaminations due to technic, this would mean that the technic yielded 1 contaminated culture out of every 109 inoculations made. Five uteri were eliminated from consideration as to bacterial flora because of circumstances leading to growth on the cultures. Ninety-eight uteri showed no growth on cultures according to method of inoculation. Eighty-one per cent of the 121 uteri considered yielded no growth on cultures. Ninety-four per cent were considered as containing no bacteria. Six per cent were classified as containing a flora. "From the above statements we feel able to conclude that the healthy bovine uterus is, in general, free of bacteria."

Azamine in the control of bovine coccidiosis, C. R. Eno (*Jour. Amer. Vet. Med. Assoc., 81 (1932), No. 5, pp. 671–673*).—The results of work with bovine coccidiosis due to *Eimeria* (*Coccidium*) *zürni,* recent studies of which by Wilson have been noted (E. S. R., 65, p. 774), have led the author to conclude that the new preparation azamine is of considerable value as a therapeutic agent in its treatment.

On vaccination against Diplococcus inflammation of the udder of the cow [trans. title], K. Tullberg (*Skand. Vet. Tidskr., 22 (1932), No. 6, pp. 302–319; Eng. abs., p. 319*).—In experimental work the administration of a vaccine avirulent for mice, prepared from diplococci producing inflammation in the udder of the cow, proved to be without practical importance as a remedy for the disease. The same was true of a vaccine virulent to mice.

Infectious abortion of cattle, C. H. Kitselman (*Kansas Sta. Circ. 164 (1932), pp. 11*).—This is a revision of Circular 135 (E. S. R., 59, p. 173).

The course of infectious abortion in cattle in a large herd [trans. title], S. Wall (*Skand. Vet. Tidskr., 22 (1932), No. 4, pp. 153–199, fig. 1; Eng. abs., pp. 197–199, fig. 1*).—A discussion of infectious abortion which relates particularly to work with a bacterin.

A continuation of the study of the etiology of infectious diarrhea (winter scours) in cattle, F. S. Jones, R. B. Little, and M. Orcutt (*Jour. Amer. Vet. Med. Assoc., 81 (1932), No. 5, pp. 610–619, figs. 8*).—A continuation of the authors' study of the etiology of seasonal diarrhea in cattle (E. S. R., 65, p. 673) indicates that the disease is an infectious one. "Vibrios of general morphological and cultural similarity were observed in mucous casts found in the feces of spontaneous cases. In one instance they were cultivated from this material, and in another they were cultivated from the inflamed intestine of a spontaneous infection slaughtered early in the disease. In addition, strains were cultivated from mucous casts in the feces and inflamed small intestine of calves in which the disease had been induced by feeding fecal suspensions from spontaneous cases. Pure cultures, when fed to calves, gave rise to well-defined intestinal disturbances and, in certain instances, the vibrios could be recovered from the inflamed intestinal tract and frequently demonstrated in the mucus found in the feces."

Mastitis.—I. The incidence and detection of sub-clinical streptococcus mastitis, G. J. Hucker, F. Trudell, and W. S. Jennings (*New York State Sta. Tech. Bul. 199 (1932), pp. 52, pl. 1*).—This is a report of a study made of 221 cows, 129 of which were examined post-mortem after a bacteriological and chemical examination of their milk had been completed, the details of which are presented at length in tabular form (E. S. R., 68, p. 377). The efficiency of the various tests made upon the milk to detect subclinical mastitis was determined in their relation to the autopsy findings as well as in their relation to the results of a physical examination prior to autopsy.

"Forty-eight per cent of all the quarters studied were found to discharge streptococci in the milk, while 9 per cent showed pus pockets upon examination post-mortem. Autopsy findings indicated that 21 per cent of 118 cows had pus in one or more quarters and 78 per cent had streptococci in one or more quarters. Over 90 per cent of the cows showed fibrosis or induration of the udder tissue in one or more quarters. Of the bacteriological tests available for the detection of subclinical mastitis, the following proved to be efficient in the order named: Microscopic examination of samples incubated over night at 37° C., veal infusion agar plates, veal infusion blood agar plates, and direct microscopic examination of samples. An excess of 3,000,000 cells per cubic centimeter indicated an infection. Determinations of the amount of chlorides, lactose, or catalase present in the milk are very effective methods of detecting infected quarters. However, the available methods for making these determinations are not sufficiently simple to permit their widespread use for routine examinations.

"Observations post-mortem on 129 udders which had been previously examined by manual manipulation indicated that a properly made routine veterinary physical examination may be a highly effective method of detecting fibrosis or induration of the udder tissues. This induration probably signifies a past or present udder infection. It was found that not all individuals known to have been infected harbor long-chain streptococci in their udders. It was also noted that in many instances long-chain streptococci could be continuously found in udders which were known never to have developed clinical mastitis. Further study is needed before the nature of these organisms is known. Positive findings obtained by the use of the strip cup and the bromothymol blue reaction always indicated an infected quarter. Negative results, on the other hand, did not assure a normal udder. The development of the fibrotic tissue in the udder following infection may permanently affect the production as well as the relative proportion of the normal constituents of the milk. For this reason feeding and other experiments should be carried out with cows whose udder tissues are known to be normal. Further information is needed regarding the significance of indurated tissue in the udder."

Field tests for chlorine in milk for the detection of mastitis, C. E. Hayden (*Cornell Vet., 22 (1932), No. 3, pp. 277–280*).—The author describes three tests, including the reagents employed and the procedure, which indicate with accuracy whether chlorine is above or below 0.14 per cent.

Trichomoniasis in cattle.—A preliminary report, M. A. Emmerson (*Jour. Amer. Vet. Med. Assoc., 81 (1932), No. 5, pp. 636–640*).—A brief preliminary account of this disease, presented in connection with a review of the literature.

The diseases of cattle in Tunis [trans. title], L. Faure (*Mém. Soc. Sci. Nat. Maroc, No. 30 (1931), pp. 67–176, figs. 2*).—Chapter 1 of this account deals with general pathology and prophylaxis (pp. 69–85), chapter 2 with special pathology and prophylaxis (pp. 86–172), and chapter 3 with sanitary police and prophylaxis (pp. 173, 174).

B. coli-like organism causing abortion in sheep, J. A. Howarth (*Cornell Vet., 22 (1932), No. 3, pp. 253–260*).—This is a report of a study of abortion occurring in 1931 in the Sacramento Valley of California in a flock of 820 Merino ewes averaging from 3 to 4 years of age. Of the 219 ewes aborting, 101 succumbed. In this outbreak the lambs appeared to have been carried to almost the full term, although a small number were aborted earlier in gestation. An organism readily isolated in pure culture from the stomach contents of many aborted lambs and from the placental cotyledons and uteri when the ewes were killed soon after aborting appeared to be typical of *B[acillus] coli.*

The results obtained with intravenous, subcutaneous, and other methods of inoculation indicate strongly that the *B. coli*-like organisms isolated are the cause of the disease studied.

Control of liver fluke in California, R. Jay (*Jour. Parasitol., 18 (1932), No. 4, p. 303*).—Brief reference is made to eradication work with the liver fluke in California, in which sheep were treated with carbon tetrachloride and the snail intermediate hosts of the fluke destroyed by means of copper sulfate or their breeding places drained, filled in, or fenced away from sheep. In this manner flukes in sheep in California have been brought under control within a period of three years, as judged by meat inspection reports and the reports of sheepmen over the State.

Studies in louping-ill (an encephalomyelitis of sheep).—II, Transmission by the sheep tick, Ixodes ricinus L., J. MacLeod and W. S. Gordon (*Jour. Compar. Path. and Ther., 45 (1932), No. 3, pp. 240–256, figs. 5*).—In this continuation of studies previously noted (E. S. R., 67, p. 744), the authors report having found louping-ill to be transmitted to sheep by the nymphal and adult females of the castor-bean tick which in their previous stage had engorged on sheep affected with the disease. The tick is infective as soon after molting as it is capable of attaching itself to a host. Evidence suggests that tick-borne fever may have an important influence on the course of the disease. In the absence of tick-borne fever the typical nervous symptoms of louping-ill are unlikely to develop, although infection with the virus of the latter occurs.

A new disease in moose.—I, Preliminary report, L. J. Thomas and A. R. Cahn (*Jour. Parasitol., 18 (1932), No. 4, pp. 219–231, pls. 2, figs. 2*).—An account is given of a disease of moose in northern Minnesota and further north in Ontario, Canada, characterized by paralysis of the legs, which causes the death in the late winter and early spring of a considerable number.

In transmission experiments in which winter ticks from affected moose attached to normal guinea pigs and rabbits, a disease was induced with exactly the same symptoms observed in the moose. The experiments have shown no transmission of the disease through nymphal ticks, although the percentage of transmission by both adult males and adult females has been high. In all cases where the ticks were removed before 24 hours no harmful effects were observed.

In almost every case paralysis of the legs resulted. In many cases excessive activity was noted, the guinea pigs moving blindly, aimlessly. Some guinea pigs are affected rapidly, others more slowly. Those which die quickly show little activity, laziness, no fever, paralysis, and death. Those which show delayed symptoms exhibit excessive activity, fever, diarrhea, paralysis, and death. Autopsies show an almost uniform engorgement of the liver, but a reduction in size of the spleen and its almost bloodlessness.

A rickettsia-like or anaplasmosis-like disease in swine, L. P. Doyle (*Jour. Amer. Vet. Med. Assoc., 81 (1932), No. 5, pp. 668–671, figs. 2*).—This contribution from the Indiana Experiment Station reports briefly upon a disease met with during the past few years which has some of the clinical and gross

pathological features of anaplasmosis. It is pointed out that the type of cell inclusion commonly found is perhaps more suggestive of rickettsia than anaplasmosis. The fact that ordinarily only a small portion of a herd is visibly affected by the disease suggests that either some limited agent spreads the causative factor or some special condition is required for the disease to develop when the specific factor is present.

Histological studies on hog cholera, II, III, O. SEIFRIED and C. B. CAIN (*Jour. Expt. Med., 56 (1932), No. 3, pp. 345–349, pls. 3; 351–362, pls. 3, fig. 1*).—In continuation of histological studies on hog cholera (E. S. R., 65, p. 381), part 2 deals with lesions of the vascular system and part 3 with lesions in the various organs.

Bacteriologic examination of commercial hog cholera virus for organisms of the pig-typhus-suipestifer group, K. WAGENER (*Cornell Vet., 22 (1932), No. 3, pp. 261–264*).—In work at Lincoln, Nebr., 56 samples of commercial hog cholera virus were examined for organisms of the pig-typhus-suipestifer group. In none of these were they found present.

Studies on immunity to swine influenza, R. E. SHOPE (*Jour. Expt. Med., 56 (1932), No. 4, pp. 575–585*).—The author finds that "of the two etiological components of swine influenza only the filtrable virus possessed immunizing properties. *H[emophilus] influenzae suis*, while essential to the production of the disease, played only a secondary and contributary rôle and, alone, conferred no immunity. Serum of swine convalescent from the filtrate disease neutralized the swine influenza etiological complex of organism and virus. Intramuscularly administered swine influenza virus was incapable of inducing illness but did render hogs immune to swine influenza. It is suggested that a specific relationship, as regards infectivity, exists between the swine influenza virus and the tissues of the respiratory tract."

The maternal transmission of vaccinial immunity in swine, J. B. NELSON (*Jour. Expt. Med., 56 (1932), No. 6, pp. 835–840, pl. 1*).—The experimental work here reported has shown that the introduction of vaccinia virus into the skin of swine calls forth a typical vesicular reaction which may be followed by a solid immunity. This acquired state of resistance was utilized in determining the route of immunity transmission from sow to young. The suckling young of immune sows, vaccinated on the seventh day or earlier, showed no reaction to the virus. Their hand-fed litter mates, however, were susceptible and reacted with the formation of vesicles.

The observations are considered to indicate that the porcine placenta is largely impermeable to protective substances, and establish the fact that colostrum functions as the vehicle for their transmission as it does for antibodies.

Anemia in relation to vaccination shock in young pigs, C. N. MCBRYDE (*Jour. Amer. Vet. Med. Assoc., 81 (1932), No. 5, pp. 582–600*).—Experiments were conducted in which hemoglobin tests were made by the Tallquist scale on 201 suckling pigs 6 to 9 weeks of age and the effects of serum-simultaneous treatment noted.

The observations indicate that "anemia is an important factor in the causation of vaccination shock and affords the probable explanation of the occurrence of vaccination shock in veterinary practice, where shock has been observed on certain farms and not on other farms in pigs that have been treated with the same serum and virus on the same date.

"Suckling pigs were held under varying conditions and an attempt was made to evaluate the importance of the three factors which play a part in the causation of anemia, viz, lack of sunshine, lack of exercise, and lack of contact with soil. The experiments recorded in this paper would seem to be in agreement with the results of other investigators who have studied the question of

anemia in young pigs, and would indicate that all three of the factors mentioned play a part in the causation of anemia and, of the three, lack of access to soil is the most important."

It is stated that no cases of shock followed the use of blood serum in the author's experiments.

Equine osteomalacia, J. H. KINTNER and R. L. HOLT (*Philippine Jour. Sci., 49 (1932), No. 1, pp. 1–89, pls. 24, figs. 16*).—This is a report of studies conducted, presented in connection with a comprehensive review of the available literature, a list of 106 references to which is included.

"Diseases affecting the bones and organs of locomotion were found to be more prevalent in Army animals in the Philippines than in like groups in the United States. Osteomalacia affects mules as well as horses, but the former exhibit far more resistance. The disease affects animals of all ages but particularly those animals in the age group between 6 to 13 years. No evidence was found indicating that sex played any part in the development of the disease. The effects of pregnancy could not be studied, due to the fact that breeding is not an activity of the Army in the Philippines.

"The cause of the osteomalacia exhibited by Army animals in the Philippines appears to be due solely to a mineral imbalance. There was no evidence that disturbance of internal secretion, parasitic infestation, heredity, infection, or vitamin deficiency played any part in the production of the disease."

Macro- and micropathology are discussed in detail. It was found that the condition dealt with is definitely osteomalacia and not the so-called osteoporosis. A serious outbreak of osteomalacia among Army animals in the Philippines was controlled by the adjustment of the calcium oxide-phosphorus pentoxide intake ratio.

Studies on canine distemper.—II, The effect of injection of filtrates of suspensions of dog spleens into ferrets, A. S. SCHLINGMAN (*Jour. Amer. Vet. Med. Assoc., 81 (1932), No. 5, pp. 627–635*).—In continuation of the studies (E. S. R., 67, p. 746), "subcutaneous injection of ferrets with sterile filtrates of suspensions of spleens from dogs naturally infected with distemper did not produce symptoms of the filtrable virus dog distemper in these test animals. Similar negative results were obtained, in the few instances tested, following the injection of unfiltered spleen suspensions of dog spleens. While a few of the ferrets became infected with streptococci and *B[acillus] bronchisepticus*, it was evident that these bacterial infections were primary and not secondary to filtrable virus infection, since the disease could not be transmitted to other ferrets by subcutaneous injection of sterile filtrates of or unfiltered suspensions of spleens from the affected animals."

Feeding of the Brucella organism to chickens and its effect on egg-production of pullets and on growth of young chicks, S. H. MCNUTT and P. PURWIN (*Jour. Amer. Vet. Med. Assoc., 81 (1932), No. 5, pp. 641–644, fig. 1*).—Cutures of *B. abortus* when fed to laying pullets caused a temporary slight decrease in egg production but had no effect when fed to 10-day-old chicks.

Studies on coccidiosis.—III, Observations on paralysis with special reference to coccidial infection, R. L. MAYHEW (*Poultry Sci., 11 (1932), No. 5, pp. 289–292*).—In this third contribution from the Louisiana Experiment Stations (E. S. R., 67, p. 458), the author describes a type of paralysis in chickens in which there is usually loss in weight and atrophy of the muscles on the affected parts and recovery is rare.

"The evidence indicates that nearly 41 per cent of the affected birds were not infected during their lifetime with coccidia. None of the birds developing paralysis were infested with roundworms, tapeworms, or other intestinal para-

sites. Cases were observed in chicks as young as 8 weeks and as old as 8 months. Thirteen of the 27 cases developed between 13 and 15 weeks of age. . . . Eight of the males were among the inoculated birds and 6 among the controls. Of the females 8 were among the inoculated and 5 among the control chickens."

Cultivation of the virus of infectious laryngo-tracheitis of chickens, J. R. Beach (*Science, 76 (1932), No. 1968, p. 260*).—The cultivation of the virus of infectious laryngotracheitis of chickens in a fluid medium, the value of which for the growth of certain viruses has been demonstrated by H. B. and M. C. Maitland[3] and others, is here described. The medium devised by C. P. Li and T. M. Rivers[4] for the cultivation of vaccine virus, consisting simply of minced chicken embryo and Tyrode's solution, proved satisfactory and was used most extensively. In only one series of cultures was the virus present beyond the twelfth generation. In this one series, which is still carried, the virus has been demonstrated in cultures of the twenty-second generation.

Chronic carriers of infectious laryngotracheitis, C. S. Gibbs (*Jour. Amer. Vet. Med. Assoc., 81 (1932), No. 5, pp. 651–654, figs. 3*).—This further contribution on infectious laryngotracheitis from the Massachusetts Experiment Station (E. S. R., 66, p. 873) reports that chronic carriers of the disease have been found eliminating virus up to 467 days. "At the end of this period, 2 fowls were still transmitting the disease to susceptible chickens at regular tests. Four of the chronic carriers had laryngotracheal râles, and 17 did not show this symptom. Four other birds recovering from infectious laryngotracheitis and having persistent laryngotracheal râles did not eliminate the virus as indicated by intratracheal swabbing into susceptible chickens. In the 21 chronic carriers studied the virus seemed to be confined to some portion of the larynx or trachea, and lesions such as inflammation, hyperplasia, ulceration, and pseudomembrane appeared to be associated with it.

"The results of these observations and experiments indicate that laryngotracheal râles are not a reliable means of detecting chronic carriers."

An acute infectious omphalitis (inflammation of the navel) of baby chicks, C. A. Brandly (*Poultry Sci., 11 (1932), No. 5, pp. 279–282*).—The author reports upon the occurrence of omphalitis in chicks, the first serious outbreak of which encountered by the Kansas Experiment Station was recognized in February, 1929, since which time a second serious epizootic has been positively identified.

In the first outbreak there was a mortality of about 5 per cent of all chicks hatched in a commercial hatchery producing about 45,000 chicks a month, the losses occurring from the time the egg was "pipped" until the chicks were approximately 72 hours of age. Most of the losses occurred before shipment of the baby chicks, and the incidence of disease was observed to be greater in the heavy breeds than in the light ones. Few losses were reported from the typical acute malady after the chicks were received by the purchaser. The second outbreak revealed a similar history, although inquiry revealed a less rapid disease course and a slightly higher mortality.

The outbreaks observed differed greatly from those described by Volkmar (E. S. R., 62, p. 566) and others.

Aerobic cultures by the author showed "organisms of the colon type as well as spore-forming varieties. A type of organism resembling closely *Bacillus mycoides* was isolated from the majority of cases from the first outbreak studied. The anaerobic flora appeared to be more constant, *Clostridium sporo-*

[3] Lancet [London], 1928, II, No. 12, pp. 596, 597.

[4] Jour. Expt. Med., 52 (1930), No. 4, pp. 465–470, figs. 2.

genes and *C. tertius*, both ordinarily considered nonpathogenes, being isolated frequently. In eight specimens from the first outbreak *C. sporogenes* was identified in four, and in two of these, as well as in one *C. sporogenes* negative case, *C. tertius* was isolated. From the second outbreak *C. tertius* was isolated from three of five cases studied, and *C. sporogenes* was identified from one of these cases and also from one case not yielding *C. tertius*. . . . Several attempts to reproduce a typical disease picture by inoculation of chicks 1 to 10 days of age with pure cultures of *C. tertius* and *C. sporogenes*, or with the various aerobes cultured, were unsuccessful."

Liberation of formaldehyde gas in incubators with a dry bulb reading of 99° F. and a wet bulb reading of 85° resulted in sterilization of exposed cultures from the outbreaks in question, and apparently resulted in complete elimination of omphalitis in the hatchery in which the outbreak occurred.

A description of apparatus of value in the rapid performance of the agglutination test, K. D. Downham and G. H. Botham (*Vet. Rec., 12 (1932), No. 37, pp. 1082–1084, figs. 2*).—A modified technic, together with a simple pipetting apparatus designed by the junior author on the lines of that first described by Beaudette (E. S. R., 62, p. 565), but with certain modifications, which has been tested and found satisfactory in hastening the speed and simplifying the method of conducting the agglutination test, is here described and tests noted. The use of the pipetting apparatus and a special blood tube box for separating the blood serum enables the operator to deal with a larger number of blood samples at one time than when using the ordinary pipettes and blood sample boxes.

A new and serious septicemic disease of young ducks with a description of the causative organism, Pfeifferella anatipestifer n. sp., J. M. Hendrickson and F. K. Hilbert (*Cornell Vet., 22 (1932), No. 3, pp. 239–252*).—Studies made of a new disease of ducks from which several thousand died on each of three ranches on Long Island are reported. The losses were chiefly in ducks from 3 to 10 weeks of age, but older ducks sometimes became infected. The old breeder ducks and ducklings younger than 3 weeks were not affected in any of these outbreaks.

"The symptoms of the disease are depression followed by complete prostration in the course of a few hours. Nervous symptoms are usually present as exhibited by a continual rapid jerking and bobbing of the head. There is usually diarrhea with a green colored dejecta, and a watery discharge from eyes and nostrils. The course of the disease is rapid in most instances, and death usually results in acute cases from 6 to 12 hours after the appearance of symptoms. More chronic forms of the disease are occasionally observed in which the ducks linger along for several days before death occurs. The diagnosis of the disease must rest primarily on the isolation of the causative organism. The lesions are suggestive but may be confused with those of duck cholera or other general septicemic diseases."

The lesions found on autopsy are essentially those of a septicemia with small hemorrhages on the mucous and serous membranes. The gelatino-fibrinous material covering the liver and heart and mottled spleen, which were found to be fairly constant lesions, will assist in differentiating this disease from duck cholera.

A small characteristic bacillus isolated with regularity on media inoculated with heart blood, liver, spleen, kidney, and lung pulp, of which there is no previous description, and for which the name *P. anatipestifer* is proposed, is thought to be the causative organism. It is very pathogenic to White Pekin ducks when injected intravenously, but subcutaneous injection and feeding of the organism gives negative results. The treatment of affected ducks appears

to be hopeless and unwise, prevention and control by the application of rigid hygienic measures appearing to be the logical method of attack. The work also suggests the probability that a vaccine consisting of dead or attenuated cultures may be of material assistance in protecting susceptible birds.

A new larval cestode, probably Hymenolepis cuneata, a tapeworm of a wild duck, H. E. Essex (*Jour. Parasitol., 18 (1932), No. 4, pp. 291–293, fig. 1*).—The author records the collection of a larval cestode of a wild duck at Long Lake, Ely, Minn., which is probably *H. cuneata*.

Apoplectiform septicemia in turkeys, F. Volkmar (*Poultry Sci., 11 (1932), No. 5, pp. 297–300*).—The author reports upon observations made during the years 1927 to 1929, inclusive, while connected with the North Dakota Experiment Station, of scattered outbreaks of apoplectiform septicemia which occurred every winter among chicken and turkey flocks on farms in the Sheyenne River Valley. The mortality among the affected turkey flocks was not great; at an average it was about 15 per cent. The duration of the epidemic was found to be about 1 week to 10 days. On autopsy the lesions found in turkeys seemed to be identical with those observed in chickens. Microscopical examination of the heartblood and of the visceral organs revealed the presence of *Streptococcus capsulatus gallinarum*.

A list of 19 references to the literature is included.

The transmission of fowl cholera to turkeys by the common house fly (Musca domestica Linn.), with brief notes on the viability of fowl cholera microorganisms, L. V. Skidmore (*Cornell Vet., 22 (1932), No. 3, pp. 281–285*).—It was found in work at the Nebraska Experiment Station that the house fly when fed on infected fowl cholera blood transmits the disease when ingested by turkeys. "A drop of fowl cholera infected blood placed on glass slide, allowed to dry, and kept at room temperature proved pathogenic eight days after. A similar drop of blood kept under same conditions was not pathogenic on the thirtieth day. Animals dead of Pasteurella infection should be immediately and properly destroyed to prevent flies from feeding on them. Chickens and more particularly turkeys are great fly eaters, and perhaps under natural conditions sometimes become infected with fowl cholera from eating flies which have fed on fowl cholera infected material."

Trichomonas phasiani, a new flagellate from the ring-necked pheasant, Phasianus torquatus Gmelin, B. V. Travis (*Jour. Parasitol., 18 (1932), No. 4, pp. 285–287, pl. 1*).—Under the name *T. phasiani* the author describes a new flagellate obtained from fecal material from the cecum of a female pheasant in Iowa.

Kamala as an anthelmintic for removing bothriocephalids from pelicans, M. C. Hall (*Jour. Parasitol., 18 (1932), No. 4, p. 304*).—The author's experiments indicate that kamala is dependably effective for the removal of bothriocephalids from pelicans when used in the dose of about 1 g.

AGRICULTURAL ENGINEERING

[Agricultural engineering investigations at the Pennsylvania Station], A. W. Clyde, C. O. Cromer, and R. U. Blasingame (*Pennsylvania Sta. Bul. 279 (1932), pp. 7, 8, figs. 2*).—The progress report is presented of studies on the mechanical drying of hay, the development of a potato harvester, corn and potato production with mechanical power, and plowing and cultivating in stony ground (E. S. R., 66, p. 278).

Ground water in north-central Tennessee, A. M. Piper (*U. S. Geol. Survey, Water-Supply Paper 640 (1932), pp. VIII+238, pls. 9, figs. 7*).—This report, prepared in cooperation with the Tennessee Division of Geology, describes briefly

the physiography, stratigraphy, and geologic structure and the sources and chemical character of the ground water in a region covering 5,800 square miles and including 12 counties in north-central Tennessee.

Irrigation principles and practices, O. W. Israelsen (*New York: John Wiley & Sons; London: Chapman & Hall, 1932, pp. XIV+422, pls. 8, figs. 174*).—This book is intended primarily to meet the needs of those who seek information concerning the aspects of irrigation which are not considered in works on irrigation engineering. Among other things it deals with sources and conveyance of irrigation water, measurement of irrigation water, pumping water for irrigation, irrigation methods, farm irrigation implements and structures, some properties of soils, basic soil and water relations, storage of water in soils, the movement of water in soils, irrigation and alkali, transpiration and evaporation, time of irrigation, consumptive use of water in irrigation, relation of crop yield to water consumed, social and administrative aspects of irrigation, amounts of water used in irrigation, efficiency and economy in irrigation, irrigation of cereals, irrigation of alfalfa, irrigation of sugar beets and potatoes, irrigation of orchards, irrigation in humid climates, and the problems of irrigation.

A list of references is given at the end of each chapter, and a number of problems and questions are presented in the appendix.

Irrigation of orchards by sprinkling, F. L. Overley, E. L. Overholser, H. L. Garver, S. C. Vandecaveye, A. Spuler, O. M. Morris, C. P. Harley, E. L. Reeves, and H. C. Diehl (*Washington Col. Sta. Bul. 268 (1932), pp. 50, figs. 16*).—The results of an investigation conducted by the station in cooperation with the U. S. D. A. Bureau of Plant Industry, Chelan County, Wash., and the Wenatchee Valley Traffic Association are reported. A description is given of gear-driven, reaction, and stationary head sprinklers and of their methods of operation. The reaction type of sprinkler was found to be the most efficient for orchard irrigation. A discussion is also given of the operating characteristics of sprinklers, including such factors as capacities, trajectory, uniformity of coverage, pressure, pipe friction, and elevation.

It was found that the factors that determine the amount of evaporation between the sprinklers and the ground are wind, relative humidity, and temperatures of irrigation water and of the air. The percentage of water evaporated from sprinklers throwing a fine mist was no greater than from those throwing relatively large droplets of water. Small droplets, however, are more easily carried away by the wind.

The equipment required for sprinkler systems of irrigation is discussed, special attention being given to piping, pump, settling box, and the sprinklers themselves, and directions are given for installation.

It was found that as the pumps for stationary spray plants are designed for pumping comparatively small quantities of liquids against high pressures they are not generally satisfactory for pumping irrigation water. Ordinary stationary spray system pipes are small and offer excessive resistance to the flow of large quantities of irrigation water. By using light, welded steel tubing and movable sprinklers, the cost of installation may be as low as $40 per acre when pumping equipment is not required. The cost, depending upon elaborateness, may be as high as $350 per acre.

Sprinklers make it possible to apply water more uniformly over areas to be irrigated, regardless of soil type or degree of slope of land. On bare soil, however, when sprinkler water is applied faster than the soil can readily absorb, puddling or washing of the soil may result. When properly applied without waste, 30 to 36 acre-in. of water are generally sufficient to keep the main root zone of the soil supplied during the growing season. Since the

sprinkler system wets the surface soil uniformly, it provides excellent moisture conditions for germination and initial growth of a new cover crop.

Trees in sprinkler plats during the experimental period made greater terminal growth and tended to produce larger-sized leaves and fruits, notwithstanding the fact that less water was applied, than did trees irrigated by the furrow system. The average amount and intensity of the color of the fruit was lessened and the maturity was slightly delayed by the use of sprinklers as compared with rill-irrigated trees.

The overhead sprinkling has no value in codling moth control but instead interferes with the proper control by spraying methods. Aphis infestation and leafhopper injury were not affected by sprinkling. Overhead sprinkling, however, seemed to aid in the control of red spiders.

There was a reduction in the average load of spray residue on mature fruit harvested from trees irrigated by overhead sprinklers amounting to from 30 to 35 per cent when compared with trees irrigated under the rill system. With ground sprinklers, the reduction was on fruit within 6 ft. of the ground and amounted to as much as 50 per cent. The reduction apparently resulted from the weathering or the solvent effect of the water sprinkled on the fruit. There was a greater spray residue load on fruit from the lower levels of trees with overhead sprinklers, possibly because of the run-off and drip that accumulated or the better initial coverage received.

The percentage of powdery mildew markings of Jonathan apples at harvest time from trees irrigated by overhead sprinklers was one-half that on fruits irrigated by ground sprinklers or with furrows.

The effectiveness of sprays under sprinklers was reduced by the washing off of the copper sprays. Pear blight was found to be more active later in the season in orchards with overhead sprinklers than in orchards irrigated by furrows. The ground sprinklers appeared to have fewer disadvantages than did the overhead sprinklers. The former required less pressure and did not wash off so much spray material. Furthermore, they did not favor certain diseases as much as did overhead sprinklers. Ground sprinklers, however, required additional piping and equipment to irrigate an equal area as compared with overhead sprinklers. The sprinklers seemed most likely to be economically successful on light, sandy, hillside soils where the natural head of water was sufficient to avoid the use of booster pumps.

[Research in soil erosion at the North Carolina Station], J. M. Snyder and F. O. Bartel (*North Carolina Sta. Rpt. 1931, pp. 47–52*).—A description is given of the work being conducted at the Statesville Soil Erosion Farm in cooperation with the U. S. D. A. Bureau of Agricultural Engineering.

Public Roads, [November, 1932], (*U. S. Dept. Agr., Public Roads, 13 (1932), No. 9, pp. 137–152+[2], figs. 38*).—This number of this periodical contains the current status of Federal-aid road construction as of October 31, 1932, a table showing mileage of extra wide surfaced roads on State highway systems, 1931, and the following articles: Road Impact Produced by a Heavy Motor Bus, by J. A. Buchanan (pp. 137–147, 151); Extra Wide Highways on State Systems (p. 148); State and Local Governmental Agencies Exempt from Federal Excise Taxes (p. 150); Vitrified Brick on Connecticut Avenue Experimental Road (pp. 150, 151); and Washing Machine Designed for Use in Determining Constituents of Fresh Concrete, by W. A. Blanchette (pp. 151, 152).

1932 Supplement to book of A. S. T. M. standards (*Philadelphia: Amer. Soc. Testing Materials, 1932, pp. 102, figs. 15*).—This pamphlet comprises the second supplement to the 1930 Book of A. S. T. M. Standards (E. S. R., 66, p. 673), and contains seven standards adopted or revised on September 1, 1932

These include among others standard methods of sampling and testing Portland cement and of a test for distillation of natural gasoline.

The bearing strength of wood under bolts, G. W. Trayer (*U. S. Dept. Agr., Tech. Bul. 332 (1932), pp. 40, figs. 17*).—The purpose of this bulletin is to supply information essential to the proper design of bolted joints in timber construction. It presents the results of several hundred strength tests of bolted timber joints in which bolts of various diameters and lengths and timber of both coniferous and hardwood (broad-leaved) species were used. Working values of various types of joint connections, covering a range in direction of bolt pressure from parallel to perpendicular with respect to the grain, are also presented. In addition to working stresses, details of design pertaining to such other features as the required spacing of bolts, the proper margin, and the like are discussed.

Substantially all the detailed information in this bulletin applies strictly to common commercial steel bolts. The stress at the yield point of the common bolts tested was approximately 45,000 lbs. per square inch, while that of aircraft bolts previously tested was approximately 125,000 lbs. per square inch. A discussion of the effect of such a difference in physical properties appears in the bulletin, and a scheme for applying the working-stress recommendations to bolts having properties greater than those of the common bolts tested is presented.

The tests made were of two general types. In one the applied load acted in a direction parallel to the grain of the wood, and in the other it was perpendicular to the grain. The tests of bolt-bearing strength of wood parallel to the grain with joints having metal splice plates showed that although the strength properties of the bolt control to a considerable extent the magnitude of the proportional-limit load on a bolted joint, within the limits of the investigation the maximum load appeared to be controlled almost entirely by the strength characteristics of the wood.

With wood splice plates the stresses were somewhat less than those obtained when metal splice plates were used. The proportional-limit values for wood plates, expressed as ratios to the crushing strengths, averaged 87 per cent of the corresponding metal-plate values for the two coniferous woods, and 75 per cent for the two hardwoods, over an L/D range of from 4 to 12. L is the thickness of the timbers in a direction parallel to the axis of the bolt, and D is the bolt diameter. However, the coniferous woods tested with metal plates averaged 23 per cent better in compressive strength than those tested with wood plates. It appears to be a logical conclusion that the average of the 87 and 75 per cent ratios would very nearly represent the true relation between the average proportional-limit stresses for joints made with wood splice plates and for those made with metal splice plates.

In the tests perpendicular to the grain of the wood using metal splices, it was found that the proportional-limit load for a bolt of given diameter increased up to a certain L/D ratio and then slowly dropped off in the larger L/D range. A relatively higher average proportional-limit stress is obtained with wood low in strength than with material of high strength. This in turn again points to the fact that the strength of the bolt in a measure determines the proportional-limit strength of the joint.

No clearly defined maximum loads were obtained in the tests. Usually the test specimens failed under combined tension across the grain and shear, ultimately splitting and shearing from end to end. The average stress under the bolt when this type of failure occurred was much farther above the average proportional-limit stress at large L/D ratios than it was at small L/D ratios. This in a way corresponds to the greater gap between maximum stress and

proportional-limit stress that obtained at large L/D ratios than at small ratios when loads were applied parallel to the grain.

The tests with wood splices show that no reduction in load need be made when wood splice plates are used instead of metal and the load on the splice plates acts parallel to the grain of the plates.

With the bearing stress parallel to the grain and that perpendicular to the grain known, the following formula is recommended for calculating the bearing stress at any angle with the grain:

$$n=\frac{pq}{p\sin^2\theta+q\cos^2\theta}$$

in which n is the unit bearing stress in a direction at inclination θ with the direction of the grain, p the unit bearing stress in compression parallel to the grain, and q the unit bearing stress in compression perpendicular to the grain.

A discussion is also given of a number of important details of design, such as proper placement of the bolts in a joint, selection of bolt diameter, centering and boring bolt holes, and the like.

An appendix deals with a method of fitting stress curves to the data.

Progress in rural and farm electrification for the 10 year period 1921–1931 (*N. E. L. A. [Natl. Elect. Light Assoc.] Pub. 237 (1932), pp. II+13, figs. 4*).—This report indicates that the number of farm consumers of electricity in the United States increased from 177,561 during 1924 to 698,786 at the end of 1931, and that 13.5 per cent of the total number of farms in the United States had electric service as of April, 1930. Of this number 4 per cent had individual plants, and 9.5 per cent were being served by electric light and power companies. At the mid-year 1932 there were approximately 1,000,000 farms with electric service from power companies and individual plants and 1,000,000 other rural customers outside of incorporated cities and villages.

The operation of farm machinery over terraced land, C. E. Ramser (*Agr. Engin., 13 (1932), No. 9, pp. 231–233, figs. 4*).—In a contribution from the U. S. D. A. Bureau of Agricultural Engineering, a brief summary of experience at the several cooperative soil erosion experiment farms on the operation of machinery over terraced land is presented, together with suggested remedies to meet the difficulties encountered.

It was found that from the standpoint of traction, particularly in crossing the comparatively loose soil in the tops of the terraces, the track-laying tractor had no appreciable difficulty, while the wheel tractor could not readily cross the terraces with the same load that it could easily handle between the terraces, and much time was lost due to digging in and stalling in crossing a terrace. This applies particularly to newly built terraces.

The 2-bottom plow was found to have a distinct advantage over the single-bottom plow when operating on the side of a terrace embankment, since there is a greater tendency for the single-bottom plow to slip sidewise down the slope. A 6-row lister consisting of three independent gangs in one frame was used practically without trouble in crossing terraces with base widths of 30 to 40 ft. and a height of 12 to 18 in. The effect of the lister was to reduce the effective height of the terraces. A 3-row tractor lister was used on slopes greater than 4 per cent and was thrown out of the ground when crossing a terrace so as to prevent reducing the height of the terrace.

The observations tend to show that, except on very wide terraces, wide drills, unless they can be made much more flexible in operation, are not adapted for use, particularly where terraces are crossed at any angle and on the steeper slopes. Where a drill is operated parallel to a terrace and the width of the

drill is less than the side slope of the terrace, no appreciable difficulty is encountered. Where the terrace is too narrow to accommodate the full width of the drill, it is practically impossible to drill seed in the terrace channel to the desired depth. In drilling across terraces at any angle the chief difficulty consists of a lack of flexibility, which results in planting the seed at different depths, too deep on top of the terrace and too shallow in the terrace channel.

With reference to the use of the general-purpose tractor for cultivating, it was found that less digging in occurs where the location of the cultivator gangs is such that they rise and fall with the wheels of the tractor in crossing a terrace.

Harrows, disks, and rollers operate better on terraced land when built in narrow sections. Flexibility in the section of a harrow is important for satisfactory operation over terraces. With the ordinary hitch the harrow works best when operated at about right angles to the terraces.

The Ohio fertilizer placement tests with corn planters, C. O. Reed (*Agr. Engin., 13 (1932), No. 8, pp. 209–213, figs. 9*).—This is a progress report of studies at the Ohio Experiment Station, some of the results of which were previously noted from another source (E. S. R., 67, p. 468). An experimental planter developed at the station is described, which represents an attempt to secure mechanically two fertilizer bands per hill, each band being fully 2 in. wide and 7 in. long and the bands spaced 3 in. apart and equidistant from the seed.

This machine carries special equipment. Each boot contains two fertilizer valves, each 2 in. wide, and the fertilizer stream is split before the material reaches the valves. Each boot opens a furrow 7 in. wide so that ample space is allowed laterally for two 2-in. bands fully 3 in. apart. To prevent incoming soil from disturbing the fertilizer bands, each depositor is so arranged that all covering soil for the fertilizer drops downward into place instead of moving in from the sides, and the seeds are protected until the fertilizer bands have been partially covered.

Although the experimenters did not succeed in securing perfectly shaped bands with this planter, nevertheless wide-band formation, with the bands well separated, has been more closely approximated than with any of the commercial jobs. As an average of all applications, it gave better results than any other planter in the 1930 tests. That it places fertilizer safely, from the standpoint of germination, is evident from the stand data. At the lighter applications the fertilizer may be a little too far from the seed to give best efficiency, but at the higher rates of application both the height and yield results show favorably, with no loss in stand.

The Ohio experimental planter was not built as a pattern for commercial adaptation in its entirety, but manufacturers have copied from it some points which have practical possibilities.

"There is some evidence that in spite of the rather extensive placement studies already made the agricultural experiment stations are not developing the theory and practice of placement as rapidly as the designer can use the information. This is especially true of power planter design."

Development of the potato harvester, R. U. Blasingame (*Agr. Engin., 13 (1932), No. 9, pp. 237, 238, fig. 1*).—In a contribution from the Pennsylvania Experiment Station a brief statement of progress in the study of potato harvester development is presented, including an enumeration of the mechanical weaknesses encountered in the experimental harvester and the redesign details to correct them.

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Harvesting and drying rough rice in California, R. Bainer (*California Sta. Bul. 541 (1932), pp. 29, figs. 14*).—The results of studies of the different methods of harvesting and drying rough rice in California and of the relation between them and milling quality are presented.

It was found that weather plays the most important part in the harvesting of the rice crop. A well-planned, adequate drainage system is essential to rice production, especially to the harvesting of the crop. The method of seeding plays an important part in the success of the windrow pick-up system. Rice seeded broadcast, either by the common broadcaster or by airplane, is easier to handle than rice that has been planted by a drill. To facilitate rapid drying the windrow must be supported by erect stubble.

In California, at present approximately 75 per cent of the crop is handled by the binder-thresher method, and 25 per cent by the combine. Practically all of the combined rice is first windrowed and after drying for from 3 to 8 days is threshed by a combine equipped with a pick-up. Direct combining is possible when the moisture content in the standing rice is below 15 per cent or when some means of artificial drying is available. A push header with a 2-ft. cutter-bar extension mounted on the front of a tractor is the most satisfactory means for the opening of rice checks when the windrow pick-up method is used. The cost of harvesting by the binder-thresher method varies from $15 to $20 per acre and by the windrow pick-up method from $4.75 to $6.75 per acre.

Losses from the windrow pick-up system may be held below 1 per cent if proper machine adjustments are maintained and if good weather prevails throughout the harvest period, while the losses from the binder method vary from 2 to 10 per cent. Only from 10 to 15 acres can be handled per day when threshing windrows consisting of the grain from a 12-ft. swath. The maximum amount that one combine should be expected to handle is 300 acres.

More agitation in the separating chamber is desirable for the threshing of rice than for wheat or barley because of the usual damp condition of the rice straw. Rice having a high moisture content does not give high yields of head rice since it lacks resilience to withstand the milling process. Rice containing an excess of moisture may be artificially dried. Temperatures in the drier should not exceed 100° F. Paddy rice may be handled safely in bulk or in sacks if the moisture content is below 15 per cent.

Fractures, called sun checks, are caused by high temperatures at the time of drying rather than merely by exposure to the sun. Temperatures of from 120 to 130° are commonly found in parts of shocks and windrows that are exposed to the sun. These high temperatures cause too rapid drying of the rice kernels, which in turn produces sun checks. The percentage of sun checking is considerably higher in these exposed parts. Sun checking in brown rice is a fair, though not a positive, indication as to what milling yields may be expected.

A device for use in determining the moisture content of drying forages, E. R. Henson (*Jour. Amer. Soc. Agron., 24 (1932), No. 8, pp. 637–641, figs. 2*).—Weighing devices developed for use at the Iowa Experiment Station in connection with studies on methods of curing and storing hay are described.

The first device enabled the operator to arrive at the moisture content by weighing the same rather large amounts of hay at desired intervals without changing their normal exposure. The moisture content of the hay was determined by calculating the loss in weight from a known moisture content at the time of cutting. This device made it possible to arrive at a satisfactorily accurate approximation of the moisture content of the hay at any time during the curing process.

For most of the work the device used was a rack or frame 10 ft. long and with teeth long enough to slide under and lift two mower swaths of hay at a time. The teeth were of fir 1.25 in. square at the base and tapering somewhat toward the outer end, and were spaced 8 in. apart and bolted solidly to a 2 by 2-in. piece at the base, making a huge comb-like frame. In lifting the rack and hay, a 1 by 5-in. board 10 ft. long was placed under the outer end of the teeth after the rack had been slid under the hay. The two outside teeth had holes in them near the end, and these were slipped over two studs in the ends of the 1 by 5-in. piece.

A second weighing device of the same general type was constructed on a smaller scale so that one man might operate and record the weights. It has a rigid frame and rigid teeth 5 ft. long. This device is lifted by means of a strap iron bar connected solidly with the back piece of the frame and bent over the load with suitable notches in the lower side to allow for the adjustment of the scale to balance the load. A 2-legged rest and a lever across the top with the scales on one end enable one man to lift the rack and read the weight on the scale. This device will weigh a 5-ft. section of swath or windrow. Ordinary milk scales may be used for the weighing.

The use of these weighing devices involves either an actual moisture determination at the time the hay is cut or an estimate based on previous determination. The usual procedure adopted for these studies was to determine the moisture content of representative samples of the hay to be harvested for several days in sequence, prior to the day of cutting.

Test data indicate that the weighing device gives a more uniform picture of the condition of the hay than is secured from shrinkage samples. It would appear difficult to sample half-dried hay in the windrow with accuracy. Swath-cured hay seems to cure out more evenly, and successive shrinkage samples do not appear so erratic. Green hay may be sampled rather accurately by the use of shrinkage samples. Half-dried or windrow-cured hay is difficult to sample accurately, as shown by the extreme variations toward the latter part of the test.

Artificial drying of agricultural products, R. B. Gray, W. M. Hurst, and E. D. Gordon *Agr. Engin., 13 (1932), No. 10, pp. 260–263, figs. 2*).—In a contribution from the U. S. D. A. Bureau of Agricultural Engineering, a brief review of the history of artificial drying of agricultural products is given, and the important research problems in forage drying are enumerated.

How to determine the quantity of air and air horsepower delivered by a hammer mill fan, J. E. Nicholas (*Agr. Engin., 13 (1932), No. 8, pp. 214–216, figs. 6*).—A mathematical analysis of the problem is presented as a contribution from the Pennsylvania Experiment Station and a working theory evolved. Tests of the theory with a 15-in. diameter 4-bladed fan operating a commercial hammer mill also are reported.

The recommended speed of operation for this mill is 2,250 r. p. m. At this speed it requires 1.85 h. p. to run the fan, while the air horsepower developed is only 0.242, making it 13 per cent efficient.

The data show that the mean velocity of the air is 58.1 ft. per second at 1,750 r. p. m. and 83.1 ft. per second at 2,495 r. p. m. This is equivalent to 39.5 and 57.0 miles per hour. This excessive speed is wasteful both from the standpoint of power required to produce this velocity and the waste in ground grain, especially the fine particles which are carried along by the air through the dust collector. The data also show that the power necessary to operate the mill without any load is equally excessive.

The condition is particularly hazardous when recommendations are made that the mill can be operated by a 5-h. p. motor, because even a small amount of useful load will at once exceed the rating of the motor.

Principles of refrigeration, W. H. Motz (*Chicago: Nickerson & Collins Co., 1932, 3. ed., pp. XI+1019, figs. 322*).—This is the third revised edition of this book, in which much of the original subject matter has been rewritten and rearranged (E. S. R., 56, p. 783).

Refrigeration, J. A. Moyer and R. U. Fittz (*New York and London: McGraw-Hill Book Co., 1932, 2. ed., pp. X+538, figs. 294*).—This is a second revised and enlarged edition of the work previously noted (E. S. R., 60, p. 781).

A temperature control index in dairy stable standardization, J. L. Strahan (*Agr. Engin., 13 (1932), No. 10, pp. 251–254, figs. 2*).—The author proposes a temperature control index as a guide to design and the use of materials of construction and illustrates its application.

Floor heating for brooder houses, H. Beresford (*Agr. Engin., 13 (1932), No. 9, p. 240, fig. 1*).—In a brief contribution from the Idaho Experiment Station the results of experiments on the heating of floors for brooder houses are reported.

Experimental slabs were constructed using several variations in the spacing of the heating element and plaster board and insulating material for the construction of the slab. One slab was made in which the soil-heating wire was embedded in asbestos plaster supported by an insulated frame, the entire slab being covered with a galvanized iron case. The operating characteristics of the different floor-heating units showed those made of concrete to be the most desirable both from the standpoint of the heat distribution and the storing of heat, which is a decided advantage where service interruptions occur. The floor-heating units made of concrete required from 6 to 8 hours to reach their maximum temperature and retained their heat from 3 to 4 hours after the current had been turned off.

Wet litter in poultry houses, M. W. Miller (*Agr. Engin., 13 (1932), No. 9, pp. 238, 239*).—Studies conducted at the Western Washington Experiment Station are reported which showed that forced or natural ventilation helps very little in keeping litter dry during wet weather. The warmer houses are built the wetter they become because of the condensation of the moisture from the warm air of the house on the cold floor. Floor heat overcomes the condensation problem and also supplies enough heat to facilitate the evaporation of moisture from the litter, thus keeping it dry.

AGRICULTURAL ECONOMICS

[Investigations in agricultural economics at the Michigan Station] (*Michigan Sta. Quart. Bul., 15 (1932), No. 2, pp. 74–95, figs. 3*).—Analysis is made by A. M. Hauke of 925 farm accounts for 1931. Tables are given and discussed showing for the 925 farms and the 290 most profitable and the 290 least profitable farms the average cash receipts and expenses; returns for capital, management, and family labor; returns for family labor and management; operator's labor and management wage; various measures of the size and volume of business; the percentages of tillable acres in legumes; the yields per acre of different crops; the amount and efficiency of livestock; labor efficiency; and a comparison of the productive man work units per tillable acre and on crops, and on productive livestock per tillable acre.

The changes during 1929–1931 made on 87 farms in central Michigan are discussed by P. F. Aylesworth. Tables are included showing for each year the average per farm cash receipts from sales of livestock of different kinds,

from crops, from labor off the farm, and from miscellaneous sources; cash expenses for different purposes; cash income; inventory changes other than cash expenses and earnings; overhead charges; and volume of business as measured by numbers of livestock, crop acres, and number of men.

Tables and charts are given and discussed by Aylesworth and E. B. Hill showing by months from January, 1921, to September, 1932, inclusive, the number of pounds of dairy ration equal in value to 1 lb. of butterfat, and the number of pounds of poultry ration equal in value to 1 doz. eggs.

Analysis is made by K. T. Wright of the potato cost records of 94 growers about equally divided between the northern, western, and eastern parts of the State. Tables are given showing for table stock and certified potatoes in each area the average acreage per farm, cost and yield per acre, and cost and value per bushel, and the relation of yields in 1931 to acre costs, by items, cost per bushel, and income and loss per acre. Another table shows for all the farms and the table stock and certified potato farms the per acre costs of growing and harvesting, by items, taxes, interest, income, profit or loss, yields, hours of man labor and horse and tractor work, the total cost and value per bushel, and the return per hour of man labor. Similar data are also shown for 53 farms in 1930.

[Investigations in agricultural economics at the North Carolina Station, 1930–31] (*North Carolina Sta. Rpt., 1931, pp. 14–20*).—Results of investigations not previously noted are reported on as follows:

A table by R. H. Rogers is included summarizing, by items, the average cost per acre of producing cotton, and the seed credit, yield per acre, and net cost per acre and pound of lint in 1930 on 36 farms in Wayne and Johnston Counties. Similar figures are given for the low-cost, the high-cost, and the high-yield farms included. A table by Rogers is also included showing, by items, the average investments, receipts, and expenses and the farm income, labor income, value of items for family use, and value of operator's labor on 62 Coastal Plain farms in 1928 and 1930. The averages for each of the four counties included are also shown.

A table by J. G. Knapp is given showing the average percentages of grades and staple lengths of the 1930–31 cotton crop grown in the Tidewater, upper Coastal Plain, and Piedmont regions of the State. Data are also included on the consumption and production of cotton in North Carolina, on the average prices received for $\frac{7}{8}$-in. middling white cotton in different local markets, and the premiums for $\frac{15}{16}$-in. middling white and $\frac{7}{8}$-in. strict middling white cotton in central and local markets, as well as information on the buying and selling practices of ginners in nine counties in the Piedmont area.

[Investigations in agricultural economics at the Ohio Station], J. I. Falconer (*Ohio Sta. Bimo. Bul. 159 (1932), pp. 217–220, fig. 1*).—Included are (1) a map showing for each county of Ohio the average mortgage debt on mortgaged farms operated by the owners, (2) a brief description of the method of using a type of lease worked out with a view to adjusting cash rent to changes in the prices of farm products, and (3) the table of index numbers of production, prices, and income previously noted (E. S. R., 68, p. 108) brought down through August, 1932.

A plan for adjusting cash rent to changes in the prices of farm products, M. Peck (*Iowa Sta. Bul. 295 (1932), pp. 189–219, figs. 2*).—A sliding-scale plan for adjusting cash rents for Iowa farm land on the prices of hogs, cattle, corn, butter, oats, eggs, poultry, wheat, hay, and sheep is described. The theory on which the plan is based, how it may be applied to pasture and hay land and

to adjusting the cash rental for a past year or the current year, and the advantages and disadvantages of the plan are discussed.

A form for a sliding-scale cash farm lease is included.

Development of agricultural credit corporations in Arkansas with State aid in 1931, B. M. GILE (*Arkansas Sta. Bul. 281 (1932), pp. 39, figs. 3*).—Following the drought of 1930, low prices of farm products, and a number of bank failures, the number of agricultural credit corporations in Arkansas increased in 1931 over the previous year, from 13 to 68, the volume of loans made increased from $1,050,843 to $4,097,284, and the number of farmers served from 1,022 to 5,595. This growth was made possible by the enactment in Arkansas of the Toland farm relief law, the text of which is given. This law created a State agricultural credit board which was empowered to sell bonds of the State of Arkansas in an amount not to exceed $1,500,000.

In this bulletin are discussed organization and operation, acts and regulations for incorporation, the amount and source of capital stock, the purposes of loans and types of security, the costs of credit and the margin on loans, and losses in 1931.

Ohio farm land acquired by life insurance companies thru foreclosure in 1930 [and in 1931], F. L. MORISON (*Ohio State Univ., Dept. Rural Econ. Mimeogr. Buls. 38 (1931), pp. 10, figs. 2; 47 (1932), pp. 9, fig. 1*).—These bulletins give for the years 1930 and 1931, respectively, data similar to those previously noted (E. S. R., 63, p. 782).

Taxation and ability to pay in South Carolina, G. H. AULL (*South Carolina Sta. Bul. 286 (1932), pp. 61, figs. 16*).—Analysis is made of the State income-tax returns filed by 1,800 individuals in 1929 and by 2,000 individuals in 1930. The income-tax returns are filed by the State Tax Commission in the order of their receipt, and the sample used was obtained by taking the first 10 of each 100 returns in 1929 and each tenth return in 1930.

Tables and charts are presented and discussed showing for each year (1) for 21 net income groups the relation of net income to income taxes paid, to other taxes, and to total taxes, and the percentage of individuals filing income-tax returns who escaped the payment of income taxes, other taxes, and all taxes; and (2) by occupations or businesses and by sources of income, the average net incomes, the percentage of individuals of different occupations reporting incomes less than different amounts in 1930, income taxes and other taxes paid, percentage of incomes absorbed by taxes, and the percentage of individuals filing returns but escaping taxation. The influence of the number of persons escaping payment of income taxes, personal exemptions, and credits for dependents, and the income-tax rate upon the amount of income taxes that would be received by the State is discussed.

The average total taxes per individual were $174.86 for 1929 and $145.68 in 1930, being 5.57 and 6.01 per cent, respectively, of the net incomes reported. Income taxes absorbed 0.57 and 0.44 per cent and other taxes 5 and 5.57 per cent, respectively, of the incomes in the two years. The group reporting negative incomes ranked seventh out of 21 income groups in 1929 and eighth out of 18 groups in 1930 in the amount of total taxes paid. In the zero to $1,000 income group, 32.9 per cent of the net incomes was absorbed by taxes in 1929 and 42.81 per cent in 1930, as compared with 3.32 per cent for the $6,000 to $7,000 group in 1929 and 3.14 per cent for the $14,000 to $15,000 group in 1930, these being groups with the lowest percentages in the respective years. The percentage of income absorbed by taxes in some occupation or business groups was 14 times as great as that in other groups. The percentages absorbed by incomes from salaries, wages, commissions, etc., were 1.84 and 1.88, respectively, in the two years, as compared with 18.67 and 42.03 for incomes from rents and

royalties. Approximately 50 per cent of the individuals required to file income returns paid no income taxes, more than one-third paid no other taxes, and 25 per cent escaped all taxation.

Estimates are given of the increases in income taxes that would result from certain changes in exemptions and rates. An increase of income taxes accompanied by a reduction of other taxes, a filing fee on all returns filed, and a periodic registration of all persons of tax-paying age with the payment of a registration fee are suggested.

The taxation of farmers in South Carolina, G. H. AULL (*South Carolina Sta. Bul. 285 (1932), pp. 43, figs. 13*).—This study consists chiefly of an analysis of data gathered over a period of years extending from 1924 to 1931, inclusive, by interviews with 936 farmers in 7 representative areas of the State. Tables and charts are included and discussed showing (1), by areas, for different years the relation of taxes to total investments, to investments in real estate, to farm income, and to operator's earnings, the average taxes per acre, and the average contribution of the farm to family living; and (2) for all the farms grouped by size, size of investment, receipts, expenditures, farm income, and operator's earnings, data as to taxes per farm, per acre, and per $100 of investment, farm income, and operator's earnings.

Total taxes decreased from $1.38 per acre for the group of farms of 25 acres or less to 40 cts. for the 1,000-acre and above group, averaging 61 cts. The estimated taxes on land alone decreased from 57 to 24 cts., averaging 34 cts. Taxes per $100 invested averaged 82 cts. and decreased from $1.02 for the below $5,000 investment group to 79 cts. for the $15,000–$20,000 group, and varied from 69 to 86 cts. in the larger investment groups. Taxes per $100 of receipts decreased from $9.32 for the farms with receipts less than $1,000 to $2.77 for those with receipts more than $6,000, and averaged $3.88. Taxes per $100 expenditures averaged $4.94 and were $7.04 for the 242 farms reporting average expenditures of $656.43. Taxes per $100 of operator's earnings decreased from $43.70 for the group earning from 0 to $500 to $6.17 for the group earning $2,500 and over, and averaged $13.08. Taxes per $100 of farm income decreased from $27.60 for the 0–$500 income group to $5.97 for the $2,500 and over group, averaging $15.34.

The farms with minus incomes paid larger average taxes per farm than all the other groups with incomes less than $2,000 and larger taxes per acre than all groups except the $2,000–$2,500 group and per $100 invested than all other income groups. Farms with negative operator's earnings paid larger taxes per farm than all other groups with earnings less than $2,000 and larger taxes per acre and per $100 invested than all other groups except the 0–$500 earnings group.

Rural government (*Amer. Country Life Conf. Proc., 14 (1931), pp. VIII+ 164*).—This volume contains the major part of the proceedings of the fourteenth American Country Life Conference, held at Ithaca, N. Y., August 17–20, 1931. Included are the following papers: The Problems of Rural Government, by F. O. Lowden (pp. 1–9); A New Rural Planning, by F. D. Roosevelt (pp. 10–17); The New Rural Municipality—Dr. Galpin's Ideas, by T. B. Manny (pp. 18–25); The Property Tax in State and Local Taxation, by B. H. Hibbard (pp. 26–29); Federal Aid, by H. C. Taylor (pp. 30–34); The A. C. L. A. Student Conference, by E. L. Kirkpatrick (pp. 35–38); County Government—A Problem in Administrative Organization, by R. H. Tucker (pp. 39–44); Government and Rural Reconstruction in Asia, by K. L. Butterfield (pp. 45–48); Rural Government in India as Observed in Connection With My Other Studies, by W. H. Wilson (pp. 49–53); Can Local Self-Government Be Preserved in Our Rural Areas? by P. W. Wager (pp. 54–60); Some Factors and Conditions Which Con-

tribute to the High Cost of Local Government, by H. L. Lutz (pp. 61–71); American Traditions in Rural Government, by G. W. Rutherford (pp. 72–85); Public Welfare, a Neglected Phase of Rural Government, by H. I. Curry (pp. 86–88); The Development of County Welfare Departments, by F. W. Hoffer (p. 88–101); The Organization and Function of the County Department of Health, by R. M. Atwater (pp. 101–104); How Should Public Health Work Be Related to the School Administration, by H. G. Miller (pp. 104–108); The Relation of the Rural Schools to a County Child Welfare Program, by M. W. Brown (pp. 108–112); Freeing Public Welfare Activities from Politics by Means of Adult Education, by J. D. Willard (pp. 112–115); Criteria for the Selection of Local Units of School Government, by H. A. Dawson (pp. 115–118); Guiding Principles for Dealing with the Problem of Administrative Units for Rural New York, by A. D. Simpson (pp. 118–121); State Aid, by F. P. Weaver (pp. 121–129); Some State Tax Problems, by M. Graves (pp. 129–132); Planning for County Management, by W. Kilpatrick (pp. 132–139); Is the Separate Incorporation of Rural Villages Necessary or Desirable? by J. F. Sly (pp. 140–146); The Case for the Township Unit of Government, by F. C. Moore (pp. 146–149); Economic and Social Bases of Cooperation Between Villages and Farmers in Matters Pertaining to Local Government, by C. R. Hoffer (pp. 149–151); What Changes Should Be Made in Our Local Units of Government? by H. P. Jones (pp. 151–154); Government Structure, Powers and Problems in the New Rural Municipality, by T. B. Manny (pp. 154–157); and Functions and Powers of Village and Township Governments, by A. W. Bromage (pp. 158–161).

Highway policy on a commercial basis, S. Peterson (*Quart. Jour. Econ., 46 (1932), No. 3, pp. 417–443*).—This article discusses the changes that have taken place in highway functions and administration, road policy as affected by social benefits and economic benefits other than to traffic, and the commercial principle as applied to road investment, financing, and use.

Farm produce received in trucks in the Columbus wholesale market, 1931, C. W. Hauck (*Ohio State Univ., Dept. Rural Econ. Mimeogr. Bul. 45 (1932), pp. [1]+20, figs. 6*).—This is a continuation of the series previously noted (E. S. R., 66, p. 384).

Livestock trucking in Missouri, F. L. Thomsen and W. R. Fankhanel (*Missouri Sta. Bul. 317 (1932), pp. 20, figs. 12*).—This study deals chiefly with the St. Louis, Kansas City, and St. Joseph markets, which receive practically all livestock shipped from Missouri points and also large numbers of livestock from Illinois, Kansas, and other States. Tables and charts are given and discussed showing for each of the three markets, by years, for hogs, cattle, and sheep the percentage truck receipts were of total receipts, 1916–1931; the number of animals and the percentage of receipts by rail and truck, 1921–1931; the percentage of truck shipments of hogs from Missouri originating at different distances from the markets; seasonal variations in truck and rail shipments, 1925–1930; percentage of the differences in truck rates accounted for by distance trucked, 1930; the variations in trucking rates in Missouri according to distance, 1930, and the average for different distances in 1930 and 1931; the rail rates on livestock, averaged by markets and kinds of livestock; and the total cost of marketing by rail and by truck for each kind of livestock.

Other charts show for Missouri, by counties, the estimated truck shipments, 1930, and the decreases from 1920 in rail shipments of hogs for 1924, 1926, 1928, and 1930; the percentage of livestock hauled by different types of truckers in Missouri in 1930; the decline from 1928 to 1931 in trucking rates for hogs and cattle to the Kansas City markets; and the relative growth, 1920–1931, in the number of hogs trucked to the three markets.

Cost of producing hay on Nevada range cattle ranches, C. A. Brennen, C. E. Fleming, G. H. Smith, jr., and M. R. Bruce (*Nevada Sta. Bul. 129 (1932), pp. 14, figs. 6*).—This bulletin shows the average production cost of hay and the important factors affecting the costs on the 20 ranches on which cattle production costs have been previously noted (E. S. R., 66, p. 681). The detailed method and procedure is the same as that in the previous study, and the present bulletin is prepared for use in conjunction with the bulletins previously noted (E. S. R., 67, p. 471).

Tables and charts show the average costs, 1928–1930 (exclusive of interest charges), total costs, and costs of growing and harvesting hay on each of the 20 ranches. The average costs, exclusive of interest, for all the ranches are also given, by items, and an estimate is made of the total cost for 1932, by items. Using 5 of the ranches with natural hay meadows and 5 with reclaimed hay fields, comparison is made of the costs per ton of growing and harvesting and total costs. The advantages and disadvantages of each type of hay growing are discussed.

On the individual ranches the costs per ton of growing hay varied from $1.08 to $10.44, averaging $1.94; the costs for harvesting from $2.57 to $8.71, averaging $3.80; and the total costs from $3.74 to $19.15, averaging $5.74. The estimated total cost in 1932 is $4 per ton. The average cost per ton of growing hay on the 5 natural meadow farms was $1.30 and that of harvesting $2.93. On the reclaimed meadow farms, the costs were $1.99 and $3.62, respectively.

Factors influencing the time of buying feeder steers and of selling them as choice summer-fed steers, H. J. Henney (*Kansas Sta. Bul. 258 (1932), pp. 36, figs. 14*).—This bulletin deals with full feeding choice steers for the late summer and early fall market and analyzes the relations between the size of the corn crop and the price of steers and between the time of buying stockers and feeders and the time of selling fat steers and the margins between purchase and sale prices.

Tables and charts are included and discussed showing the corn production, 1905–1931, in the United States, Kansas, and the Corn Belt States; the relation, 1921–1929, between corn production in the eight major Corn Belt States and fed steers slaughtered at Chicago one year later; the trends at Chicago of choice steer prices for 15 months and good steer prices for 14 months after small and large corn crops; margins between purchase price of feeders and stockers at Kansas City and sale price of fat steers at Chicago, 1901–1929; relation between corn production in the eight Corn Belt States, 1925–1930, and the change at Kansas City in price of feeders from early to late fall; relation between the price trend of feeders at Kansas City from February to May one year and the succeeding year; price trends of choice feeders from February to May in the years 1921–1930; the effect of time of the July to December peak price, 1922–1930, of choice fat steers on the time of the peak price the next year; the effect of corn production the previous year and the change in the price of corn from winter to summer on the supply of good to choice steers at Chicago in September and October; the effect of current corn production on the fall trend of feeder prices; and the effect of feeder price trend one year on the trend during the same period in the following year. Some of the findings and conclusions reached follow:

The time of buying was as important as the time of selling. Sizes of the corn crops, both old and new, are responsible for many of the cattle-price changes, a large crop tending to furnish more grain-fed cattle than a small crop during the 12 months after November. Profits or losses on choice grain-fed steers sold from January to May are more important than size of the corn

crop in determining the strength of the feeder demand in the following August to September. Price declines or advances for any short period tend, in the absence of more important influences, to reverse the price trend for the same period the following year by causing the cattle feeders to market their supply when prices are highest.

In a large corn crop year, late fall purchase of feeders was usually more profitable. In years following heavy winter-feeding losses, fall purchases of feeding steers rather than stockers tended to net the greatest margin if steers are finished for the next summer or fall market. Stockers purchased in the fall and sold the next fall as grain-fed cattle, if handled on the deferred-feeding system, usually made a greater margin than feeders purchased either in the fall or spring or stockers purchased in the spring. A corn crop 10 per cent above normal has tended to result in a supply of fed steers at Chicago the next fall from 15 to 20 per cent above normal. A large corn crop in the Corn Belt has resulted in more than the usual decline—approximately 10 per cent—in the fat-cattle price from October to January. The usual decline in fat-steer prices from October to April has been from 5 to 8 per cent in years of small and from 15 to 20 per cent in years of large corn crops. In large crop years a large part of the decline came in December and January.

From the standpoint of possible market declines, full feeding choice steers for the late winter market has been more risky than full feeding for any other market. The risks in holding choice steers fed from October to January have not been as great after small corn crops as after large crops. May and June fat-steer prices have seldom been above the prices in the preceding October and November. May prices have been higher only with very small corn crops. The June price tended to be higher than that of April or May, especially if the May prices were lower than the April prices.

The poultry enterprise on Kansas farms, M. Evans (*Kansas Sta. Bul. 257 (1932), pp. 23, figs. 5*).—This bulletin is based chiefly on data published by the U. S. Department of Agriculture and the Kansas State Board of Agriculture, the findings in studies made in Jackson and McPherson Counties, 1920–1924, and in Bourbon County in 1925 and 1926, and data from farm account records secured by the Extension Service of the Kansas State College.

The size, distribution, and investment in the poultry industry of the State, prices of poultry products, and the factors affecting such prices are discussed. Tables are included and discussed showing the effects of size of flock on investment, man labor used, egg production, amount of feed fed per 100 hens, different items of operating expense, receipts of different kinds, income and profits from poultry, livestock and poultry products used on the farm, and the farm family consumption of eggs and poultry.

Man labor requirements per hen decreased from 2.9 hours per year for flocks of 100 hens or less to 1.6 hours for flocks of 151 hens or more. No great variation was found in yearly egg production per hen in the different size flock groups, but meat production per hen averaged 7.7 lbs. in the small flocks and 3.6 lbs. in the large flocks. On most of the farms studied, farm-grown feeds made up 90 per cent of the ration fed. Cash expenses other than feed purchased made up about 10 per cent of the total cost of the poultry enterprise. Feed averaged 43.4 per cent of the total cost for the flocks studied, man labor 28.7, building charges 6.1, interest 4.8, overhead 3.1, and other expenses not cash 7 per cent.

Cash sales constituted 70 per cent of the total receipts, and products used on the farm 30 per cent. Eggs sold and used on the farm constituted 63 per cent and poultry sold and used 37 per cent of the total receipts. Total receipts per hen decreased from $3.14 for the small flocks to $2.20 for the large flocks,

averaging $2.51. Receipts from the poultry enterprise constituted 5.5 per cent of the total farm receipts on the farms with flocks of 100 hens or less and 22 per cent on the farms with flocks of more than 300 hens. Per capita consumption of eggs and poultry were higher on the farms with the larger flocks.

A survey of some of the factors that influence the price of eggs in the Cleveland territory, W. B. STOUT (*Ohio State Univ., Dept. Rural Econ. Mimeogr. Bul. 35 (1931), pp. [3]+51, figs. 16*).—Tables and charts are included showing the origin of eggs received by 22 wholesale dealers in the Cleveland market in 1929. Based on information from 415 egg producers in 17 counties in the northeastern part of Ohio, analysis is made of the grading of eggs sold, the marketing outlets used, and the prices received. The attitude of high class retailers toward direct buying from the producers is discussed. Analysis is made of (1) grades of eggs and prices on the Cleveland, Chicago, and New York markets; (2) the price spreads between comparative grades of eggs on the three markets and between different grades on the same market; and (3) the relation of cold storage holdings to the prices received for eggs.

A preliminary report dealing with some of the marketing problems of the West Virginia Poultry Producers Cooperative Association, L. C. FOSTER and F. E. DAVIS (*Ohio State Univ., Dept. Rural Econ. Mimeogr. Bul. 44 (1932), pp. [1]+17+[1], figs. 6*).—This is a study of the grades of eggs delivered by 65 Ohio members of the West Virginia Poultry Producers Cooperative Association during the period July 1 to December 31, 1931, and of the relation of the size of flocks to the grades of eggs. Tables and charts are included showing, by months, the deliveries (number of dozens and percentages of total) of eggs of different grades by the producers grouped by size of flock—under 126 hens, 126–225 hens, 226–325 hens, and over 325 hens. The percentages of eggs of different grades delivered by the poorest and best producers in each group are compared with the average for the group, and the increased returns that the poorest producers would have received if their grades had equaled those of the average producers and of the best producers of the groups are shown.

Milk marketing information on Ohio markets, 1932: Cooperative dairy marketing associations and their milk selling plans, P. A. YOUNG, C. G. MCBRIDE, and R. W. SHERMAN (*Ohio State Univ., Dept. Rural Econ. Mimeogr. Bul. 46 (1932), pp. 32, figs. 7*).—The flat price, use classification, and base surplus methods of selling milk are described. The plans used in Akron, Canton, Cincinnati, Columbus, Dayton, Springfield, and Portsmouth, Ohio, and Pittsburgh, Pa., are discussed. The operation of typical base surplus plans—one with a different base used for each month, and one with a base set according to the producer's production during the last five months of the year—is illustrated, using five typical producers.

A study of the milk and cream supply of Greater Providence, 1929–1931, J. G. FIELDING (*Rhode Island Sta. Bul. 237 (1932), pp. 40, figs. 14*).—Tables and charts are given and discussed showing for the years 1929–1931 the annual and monthly receipts (1) of milk and cream, by States of origin; (2) of grade A milk, total, raw, and pasteurized; (3) of grade A milk from Massachusetts and Rhode Island; and (4) the monthly and annual sales and surplus grade A milk.

Total receipts of milk in the area increased nearly 12 per cent during the period. Receipts of cream decreased about one-third. Rhode Island furnished on an average about 51 per cent of the total milk supply and 85 per cent of the total grade A supply. Shipments of milk from Rhode Island decreased about 12 per cent in 1931 compared with 1930. Grade A milk constituted about 20 per cent of the total supply of the area. The grade A raw supply decreased

during the period from 65 per cent to about 52 per cent of the total grade A supply.

The organization and operation of cooperative creameries in Kansas, G. MONTGOMERY and W. J. CAULFIELD (*Kansas Sta. Bul. 259 (1932), pp. 44, figs. 7*).—The problems and essentials in organizing a cooperative creamery, building and equipment costs, the principles of successful operation, the relation of volume of business to operating expenses, and the factors affecting the price that can be paid for butterfat are discussed. Data obtained in a survey made of 9 cooperative creameries in north-central Kansas form the basis for the greater part of the discussion.

Economic aspects of the marketing of honey, M. P. RASMUSSEN (*U. S. Dept. Agr., Bur. Agr. Econ., 1932, pp. [2]+139, figs. 8*).—This is a mimeographed preliminary report of a study of the honey marketing situation undertaken during 1927 and 1928 in cooperation with the New York State College of Agriculture. Five phases of honey marketing in the United States are considered as follows: (1) A study of wholesale prices in western United States and New York City, 1904–1928, of extracted and comb honey from different floral sources and in different types of containers, including a comparison of the prices of honey, sugar, butter, bee supplies, farm wages, and the U. S. Bureau of Labor index of wholesale prices of all commodities; (2) a review of national production data, and studies of local production and marketing of honey in New York State and Minnesota to ascertain how beekeepers in these States disposed of their honey during 1926 and 1927; (3) a study of the distribution of honey in the principal cities in the eastern, midwestern, southern, and far western sections of the United States, made to ascertain the relative importance of different wholesale agencies as outlets for honey and the difficulties encountered in the wholesale distribution of honey; (4) studies of honey distribution by retail stores in the New York metropolitan area, Chicago, and in Elmira, N. Y., a typical small eastern manufacturing city, made with a view to learn how much honey was being sold by the average store, what sales resistance was being encountered, and how the volume of sales might be increased; and (5) a study of consumer likes and dislikes with regard to honey, made to ascertain consumer habits and attitudes toward honey, per capita consumption of honey, its uses, and related facts.

Marketing Pennsylvania potatoes in fifteen-pound containers, T. K. COWDEN (*Pennsylvania Sta. Bul. 281 (1932), pp. 19, figs. 3*).—The results obtained by 45 Pennsylvania potato growers in 19 counties who marketed potatoes in 15-lb. containers in 1931 and by 172 stores in 35 towns and 21 counties with which the growers dealt are analyzed. The cost of marketing in 15-lb. containers as compared with 120-lb. sacks, the cost of grading and sacking bakers from seed potatoes, the returns to growers from potatoes marketed in 15-lb. containers, market preferences, merchants' opinions regarding selling potatoes in the small containers, types of outlets for potatoes marketed in small containers, the average spread between the prices of potatoes in small containers and 100-lb. sacks on eastern terminal markets from October 1, 1931, to June 1, 1932, and the advantages and disadvantages of marketing Pennsylvania potatoes in 15-lb. containers are discussed. Some of the findings were as follows: Marketing potatoes in 15-lb. cloth bags cost 15.66 cts. per bushel more than marketing in 120-lb. sacks. The return in advertising value, ability to move the crop, and the development of new markets were more important than the direct financial returns from the use of the smaller container. Of the 45 growers cooperating, 21 believed that the use of small sacks is not practical. The retail grocery store was the best outlet for 15-lb. containers. The open-mesh sack was the best small container. It was found that the quality of potatoes in

15-lb. containers must be high, and in most cases a select grade was most satisfactory.

The author states that "marketing potatoes in 15-lb. containers appears to offer little advantage to the Pennsylvania potato industry, at least during the next few years. A few growers may be able to use this special package advantageously in their marketing program. A limited market exists for a good quality potato in a consumer-size package. The grower must find a trade that will pay for the service before this method of marketing will be profitable. Thus far, in most cases, the trade has been unwilling to pay the additional price for the bag alone, and also has expected to obtain a superior quality of product in the small package. As long as the small bag serves as a means of identifying quality, it has some advantages."

The international wheat conferences during 1930–31, A. E. Taylor (*Wheat Studies, Food Research Inst.* [*Stanford Univ.*], *7 (1931), No. 9, pp. [1]+439–475*).—This is one of a series of studies of the world wheat situation and outlook in relation to national policy. Agricultural distress is indicated as the cause of agrarian agitation for higher wheat prices. Some sixteen conferences, held by wheat-surplus-producing countries to promote collective action in the matter of raising wheat prices, are reviewed.

It is stated that at the London conference a quota plan failed of official acceptance because of the position of the delegation from the United States in support of the continuation of international marketing of wheat upon established grain exchanges. "It is the first time an international monopolization has been sought to control a staple foodstuff."

Financial results of speculative holding of wheat, H. Working, A. M. Hobe, and P. S. King (*Wheat Studies, Food Research Inst.* [*Stanford Univ.*], *7 (1931), No. 8, pp. [1]+405–437, figs. 9*).—Speculative holding of wheat, defined as "holding in the hope of . . . anticipated speculative gain," is considered as a part of the process of marketing the crop or of taking it out of the hands of producers and placing it in the hands of consumers. Distinctions are made between speculative and other gains and losses, such as merchandising, processing, transporting, or storing. Distinctions are also made between risk-taking, in which the speculator anticipates price changes but does not produce them by any act of his own, and manipulation.

Gains and losses on the visible supply and on all commercial stocks as experienced by different classes of dealers and traders are reviewed. The conclusion is reached "that speculators in wheat futures taken as a group have in the past carried the risks of price changes on hedged wheat and have received no reward for the service, but paid heavily for the privilege."

Projected waterways in North America as related to export of wheat, A. E. Taylor (*Wheat Studies, Food Research Inst.* [*Stanford Univ.*], *8 (1932), No. 9, pp. [1]+445+468*).—Three waterway improvements, the Hudson Bay, the Mississippi and its tributaries, and the St. Lawrence, are discussed.

Optimistic forecasts of advantages to American wheat growers are viewed as unwarranted. The Hudson Bay route may be of significance to Saskatchewan. The Mississippi route will mainly divert Kansas and Nebraska wheat from present rail or rail-and-lakes routes. Texas and Oklahoma will not be affected. Savings of about 5 cts. a bushel in freight rates "would be divided, in proportions varying from year to year, mainly between growers of export wheats affected and European consumers."

The opening of the St. Lawrence waterway might lead to expansion of acreage in Canada and lower wheat prices in the United States. Justification of this improvement so far as the United States is concerned must be based on other considerations than the export of wheat. It will probably benefit urban in-

dustries more than agriculture, and farmers more in the prices they pay than in the prices they receive.

Economic nationalism in Europe as applied to wheat, A. E. TAYLOR (*Wheat Studies, Food Research Inst.* [*Stanford Univ.*], *8 (1932), No. 4, pp. [1]+261–276*).—The world-wide depression is viewed as tending to accentuate previously existing nationalistic tendencies. Economic, financial, and political difficulties are influencing leading European countries to adopt programs and policies characterized as economic nationalism. Centering upon wheat, these measures are leading to expansion of production and curtailment of imports. Immediate consequences are lower quality of wheat products, higher prices, higher costs of lower-scale living, and reduced consumption—all these manifestations in the face of an overwhelmingly large world wheat supply. Such measures are viewd by the author as better suited to a period of wheat scarcity than to one of abundance.

The conclusion is reached that such self-containment measures are gravely complicating the world wheat problem; that the more European countries enter into them, the less wheat the United States may reasonably expect to export to Europe; that these developments bear little relation to the principle of comparative advantage; and that though restrictive legislation may hold on tenaciously once it is adopted, it will tend to subside with the restoration of prosperity.

Russia as a producer and exporter of wheat (*Wheat Studies, Food Research Inst.* [*Stanford Univ.*], *8 (1932), No. 5–6, pp. [1]+277–375, pls. 4, figs. 10*).—This represents a condensation, by M. K. Bennett, of a study based upon the work of V. P. Timoshenko.

From an examination of factors influencing wheat production in the Soviet Union, it seems improbable that that country will soon recover the pre-war position of the Russian Empire as an exporter of wheat. Sizable exports may be anticipated, however, in years of high yields.

For the pre-war level to be reached, production would have to increase faster than population. The heavy exports of 1930–31 were made possible by restricting domestic consumption. Expansion of the total area cultivated must take place on lands heretofore fallowed and relatively poor-quality land of Asiatic Russia. In this process it is improbable that yields will be increased or even sustained.

In the expansion of the cultivated area, developments planned for animal husbandry and the production of feed and forage crops will compete with bread grains for the land. Though wheat acreages may increase faster than rye, rye being a bread grain in Russia, the amount of wheat exported will be conditioned upon domestic requirements for bread grains.

Factors affecting exports of United States hog products, G. B. THORNE and P. RICHARDS (*U. S. Dept. Agr., Bur. Agr. Econ., 1932, pp. 51, figs. 16*).—The factors affecting United States exports of hog products to the United Kingdom, Germany, Cuba, Canada, and other countries; the prospective trends of hog production in Germany and Denmark, the Netherlands and Poland, Canada, Russia, and other countries; and the new developments affecting United States exports of hog products are discussed.

Charts and tables are included showing United States exports of hog products, 1865–1931, and commercial hog slaughter, 1880–1931; United States exports of pork and lard expressed as a percentage of total production, 1900–1931; inspected hog slaughter in Germany and Denmark, and United States exports of hog products, 1911–1931; the ratio of United States pork exports to lard exports, 1876–1931; the relation of United States exports of hog products and of total United States exports of pork to hog slaughter in Germany and Denmark

and to United States hog slaughter; relation of total United States exports of lard to hog slaughter in Germany and to United States lard production; imports into the United Kingdom, 1900–1931, of bacon from the United States, Denmark, and other countries, of ham from the United States, Canada, and other countries, and of lard from the United States and other countries; lard imports into Germany, 1900–1931, from the United States and other countries; relation of United States exports of bacon, hams, and shoulders to the United Kingdom to total bacon imports from continental Europe to the United Kingdom and to United States hog slaughter; relation of United States exports of lard to Germany to hog slaughter in Germany and to United States lard production; relation of United States exports of bacon, hams, and shoulders to Germany to hog slaughter in Germany and Denmark and to United States hog slaughter; relation of United States lard exports to Cuba to United States lard production and to value of Cuban sugar crop; and the relation of hog-feed price ratios and hog slaughter in the United States, Germany, and Denmark.

A selected bibliography is included.

Crops and Markets, [November, 1932] (*U. S. Dept. Agr., Crops and Markets, 9 (1932), No. 11, pp. 409–448, figs. 5*).—Tables, charts, reports, summaries, and notes of the usual types are given. An article on Income from Farm Production in the United States (pp. 439–443) includes and discusses tables showing the gross income from farm production, by years 1909–1932, and by crops and livestock products for the years 1929–1932; the gross income, 1929, 1930, and 1931, from crops and from livestock and livestock products, by States and also by commodities; the gross income, annual expenditures, and income available for operators' capital, labor, and management, 1924–1931; and for owner operators reporting, 1924–1931, the average size of farm, value of farm real estate, value of farm, personalty, receipts by source, cash outlay by principal items, change in inventory of personal property, net receipts, interest paid, amount spent for farm improvements, value of food produced and used on farms, value of family labor, change in value of real estate during the year, and the proportion of farmers obtaining net incomes within specified ranges. Data are also given, by geographic divisions, for farm returns in 1930 and 1931 and for ranges of net returns for 1931.

Greece: A guide to official statistics of agriculture, population, and food supply (*U. S. Dept. Agr., Bur. Agr. Econ., Agr. Econ. Bibliog. 39 (1932), pp. IV+142, fig. 1*).—This is the second bibliography of the series previously noted (E. S. R., 68, p. 266), and part 2, methods of collection and analysis of official statistics, by J. D. Black and C. Ladas, covers the same subjects as part 2 of the previous report. Part 1, compiled by A. M. Hannay, includes official publications of the Greek Government containing agricultural statistics found in the library of this Department and the Library of Congress.

Agricultural co-operation in Ireland (*London: G. Routledge & Sons, 1931, pp. XIV+424*).—The history of cooperation in Ireland is traced and the legal status described. The development and present status and types of cooperative creameries, agricultural and credit societies, bacon factories, marketing, insurance and other organizations, and the central organizations are discussed. A detailed survey, by counties, of existing organizations is included.

This book was prepared by The Horace Plunkett Foundation.

Agricultural cooperative organizations in Czechoslovakia, L. F. Dvořák (*La Coopération Agricole Tchécoslovaque. Praha (Prague): Union Cent. Coop. Agr., 1931, pp. 74, pls. 14, fig. 1*).—The development and present status of the cooperative movement are described, and the principal organizations and their results are discussed.

Year book of agricultural co-operation, 1932, edited by The Horace Plunkett Foundation (*London: G. Routledge & Sons, 1932, pp. VI+540*).—Included are articles as follows: (1) Co-operative Education, by M. Digby (pp. 26–62); Canada—The Wheat Pools, by J. T. Hull (pp. 135–153); Co-operation in India, by H. L. Kaji (pp. 217–232); The Present Position of Agricultural Co-operation in Germany, by Gennes (pp. 269–284); Norway's New Milk Plan, by R. Mork (pp. 300–305); China—Origin, Extent and Prospects of the Movement [Agricultural Cooperation], by C. M. Chen (pp. 393–398); and China—Promotion [of Agricultural Cooperation] by the International Famine Relief Commission, by Y. S. Djang (pp. 399–408); (2) articles describing agricultural cooperation in different countries as follows: Ireland—The Irish Free State (pp. 97–114), Northern Ireland (pp. 114–123), by H. F. Norman; Scotland, by J. M. Ramsay (pp. 124–127); Canada—Ontario, by J. A. Hand (pp. 154–162); New Zealand, by T. C. Brash (pp. 163–166); Australia—Western Australia, by T. H. Bath (pp. 167–171); Australia—New South Wales, by A. B. Sheldon (pp. 172–181); Tasmania, by R. W. Winspear (pp. 208–213); Jamaica, by Lord Olivier (pp. 233–238); Dutch East Indies, by J. H. Boeke (pp. 259–262); France, by L. Tardy (pp. 285–299); Finland, by H. Kennedy (pp. 306–319); Poland, by J. Bargiel (pp. 320–337); Italy, by G. Costanzo (pp. 338–343); Greece, by S. Andoniades (pp. 376–384); Egypt, by I. Rashad (pp. 385–392); Argentina, by D. Bórea (pp. 409–418); and Mexico, by the Director of Agriculture (pp. 419–424); and (3) unsigned articles on cooperation and the crisis (pp. 1–25); Co-operative Auditing (pp. 63–76); England (pp. 77–96); Wales (pp. 128–134); Notes on New South Wales (pp. 181–192); Australia—Queensland (pp. 193–207); Union of South Africa (pp. 214–216); Trinidad and Tobago (pp. 238–240); British Guiana (pp. 240–244); Ceylon (pp. 244–246); Malaya (pp. 246–248); The Gold Coast (pp. 248–252); Nigeria (pp. 252, 253); Kenya (pp. 253–255); Fiji (pp. 255–258); The French Colonies (pp. 263–268); Iceland (pp. 344–349); Latvia (pp. 350–356); Estonia (pp. 357–361); Czechoslovakia (pp. 362–369); and Hungary—A National Plan (pp. 370–375).

The new legislation on cooperation and recent publications are reviewed, and a bibliography on agricultural cooperation is included.

RURAL SOCIOLOGY

Farm standards of living in Faulkner County, Arkansas, T. C. McCormick (*Arkansas Sta. Bul. 279 (1932), pp. 39*).—The data for this study were gathered from 385 farm families, one-half of which were natives of the county and three-fourths were natives of the State. Of the total number of families studied, 270 were owners and 115 tenants. The average size of owner families was 5.5 members, while tenant families averaged 5.7 members. The average net cash income per owner family was $809 and that of tenant family was $510. When the money value of farm products was added to net cash income, owners received $1,407 and tenants $1,024 per annum.

Owner families enjoyed better standards of living. The average number of rooms per owner dwelling was 4.4, compared with 3.7 per tenant dwelling. Thirty-nine per cent of owners and 15 per cent of tenants had water-heating arrangements. Six per cent of owners and 2 per cent of tenants had refrigerators. All tenants' homes and 96 per cent of owners' homes were lighted by kerosene lamps. Ten per cent of owners and 7 per cent of tenants had telephones. Forty-four and one-tenth per cent of owners and 14.8 per cent of tenants had automobiles. Owners owned an average of 40 books and received 4.7 periodicals and tenants owned 25 books and took 3.4 periodicals. Of periodicals, weekly papers stood first and farm journals second. Only 18 per

cent of owners and 7 per cent of tenants took daily newspapers. Excluding school and church affiliations, 46 per cent of owner families and 65 per cent of tenant families belonged to no organization.

Owner families received 57.4 per cent of their living from the farm and tenants 58.6 per cent. Owners and tenants spent, respectively, 50.9 and 56.4 per cent of their income for food, 12.4 and 12.6 for clothing, 10.3 and 8.8 for rent, 4.6 and 4.6 for fuel and light, 4 and 4 for furnishings and equipment, 2.3 and 1.4 for miscellaneous household expenses, 3.6 and 4.7 for health, 2.1 and 1.7 for advancement, 0.9 and 0.9 for social and recreational expenditures, 2 and 2.2 for miscellaneous personal items, 1.1 and 0.9 for church and charity, 1.4 and 1.3 for life insurance and savings, and 4.4 and 0.5 for taxes.

Contrary to general theory, both owner and tenant families tended to have more living children as their net cash incomes became larger. Net cash income was most closely associated with the family standard of living, but of some importance also were distance from town, education of operators, and, indirectly, age of operators.

The adequacy of farm standards of living, N. L. Sims and C. R. Wasson (*Ohio State Univ., Dept. Rural Econ. Mimeogr. Bul. 34 and Oberlin Col., Dept. Sociol. Mimeogr. Bul. 1, Joint Pub., 1931, pp. 44, pls. 7*).—This bulletin reports the results of a study, made in the fall and winter of 1929 and 1930 by the department of sociology of Oberlin College, of the relative quality and costs of various institutional services in Oberlin village, exclusive of Oberlin College, and the Oberlin urban area. Educational, church, public health, welfare, fire protection, library, and hospital facilities, and economic, fraternal, patriotic, social, recreational, and educational voluntary associations are discussed.

Some trends in rural social organization in four Ohio counties, E. D. Tetreau, R. C. Smith, and J. P. Schmidt (*Ohio State Univ., Dept. Rural Econ. Mimeogr. Bul. 42 (1931), pp. 44, fig. 1*).—This is a study of the changes that have taken place in some of the organizations and institutions in Darke, Defiance, Pike, and Trumbull Counties since their settlement. It was made with a view to determine any general tendencies in the changes and the factors responsible. The physical features and agriculture of the counties are briefly described, and the changes in each county in population, communication facilities, the school, the church, lodges, farmers' institutes, the grange, the farm bureau, cooperative associations, 4-H clubs, health organization, and recreation are discussed. A chart is included showing the periods of organizational change in the four counties.

The principal factors conditioning organizational change were increasing ease of communication, agricultural changes, changes in the numbers and distribution of population, and the price cycle.

An economic and social survey of Roanoke County, G. R. Stevens (*Va. Univ. Rec., Ext. Ser., 15 (1930), No. 1, pp. 130, pls. 5*).—This is the fourteenth in a series of economic and social surveys of Virginia counties. A very detailed picture of natural resources and economic and social development is presented.

An economic and social survey of Frederick County, J. J. Pickeral and G. Fogg (*Va. Univ. Rec., Ext. Ser., 15 (1930), No. 2, pp. 142, pls. 5*).—This survey includes a historic sketch of Frederick County and information concerning its towns, natural resources, population, wealth, taxation, manufacturing, agriculture, schools, organizations, problems, and progress.

The awakening community, M. Mims and G. W. Moritz (*New York: Macmillan Co., 1932, pp. XXVII+273*).—This is the story of Miss Mims's work "in organizing the communities of Louisiana to know better their needs and to

meet these needs through the cooperative neighborly spirit." Part 2 includes programs for community nights which have been successfully used by the organized communities of Louisiana.

The story of a village community, H. O. SEVERANCE (*New York: G. E. Stechert & Co., 1931, pp. [11]+178, pls. 2*).—The author tells a historical and reminiscent story of his home village. The life and activity of the village, including the homes, schools, churches, businesses, men and women, are described from personal knowledge. From the first ten chapters one receives a picture of the settlement and growth of a rural community. The eleventh chapter shows how this community became urbanized and industrialized.

A guide to the literature of rural life, compiled by B. Y. LANDIS (*New York: Fed. Council Churches of Christ Amer., Dept. Research and Ed., [1929], pp. 24; Amer. Country Life Assoc., 1932, rev. ed., pp. 16*).—The 1929 edition is an annotated list of recent and more accessible publications, and the 1932 edition is a revision.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

College botany, G. B. RIGG (*Philadelphia: Lea & Febiger, 1930, pp. XVIII+17–442, pl. 1, figs. 156*).—This book has been prepared from the viewpoint of its use in a liberal education. "The manner in which this viewpoint has been used in this book is discussed in the introduction."

The story of wheat (*Indiana Sta., 1931, pp. 69, figs. 70*).—This publication is described as "an interesting by-product" of the work of a special committee working under the auspices of the Commonwealth Fund in a study of "the problem of the content of the social studies in the modern school curriculum." A popular account is given of the history and status of wheat production, especially in the United States, describing cultural and harvesting practices and machinery, the development of harvesting implements, improvement of the crop, marketing, the commercial movement of wheat and wheat products, milling, baking, and various wheat products.

FOODS—HUMAN NUTRITION

Food preparation, M. D. SWEETMAN (*New York: John Wiley & Sons; London: Chapman & Hall, 1932, pp. XI+344, figs. 50*).—This volume differs from the usual college text on food preparation or experimental cookery in that, in view of the fact that food preparation is no longer confined to the household, considerable attention is given to food processing on a commercial scale and by commercial methods. Less attention is given, moreover, to skills and technics than to the evaluation of methods of food processing from the standpoint of nutritive value, digestibility, palatability, sanitary quality, and economy of the resulting product. The background for the later treatment of various types of foods is laid in the first three chapters, dealing with the evaluation of foods according to the five standards just enumerated; a classification of the processes used in food preparation as subdivision and fractionation, heat, removal of heat, and chemical processing; and a discussion of the structure of foods in terms of colloidal and physical chemistry.

The general plan followed in the succeeding chapters dealing with the various food groups is illustrated by the outline of the first of these chapters on cereals: The consumption of cereals in the United States, the proximate composition of cereals, the structure of cereals and the processing of cereals and evaluation of the products including heating, subdivision, fractionation, malting, and irradiation. Essentially the same plan is followed in the remaining

chapters on fruits and vegetables (two chapters), milk and its products, eggs, fats and oils, meat and allied foods, sugars and their use in food mixtures, frozen mixtures, and flour mixtures (two chapters). A final chapter deals with meal planning according to the standards used in judging individual foods.

Experimental cookery, B. Lowe (*New York: John Wiley & Sons; London: Chapman & Hall, 1932, pp. XI+498, figs. 60*).—The author states in the introduction that "the principal function of this volume is to present our newer knowledge of food preparation and cookery processes from a chemical and physical basis, particularly that of colloid chemistry," and further that "it is hoped that this volume will fill a need for a textbook for discussion material for food-preparation courses in colleges and as a reference work for teachers of secondary schools. It is also hoped that the reference to and summary of articles in the literature will create an interest on the part of the student to read and interpret them for herself." The particular value of the text, in the opinion of the reviewer, is as a reference work on the colloidal chemistry of cooking processes and on original source material in experimental cookery. The arrangement of subject matter is as follows: The relation of cookery to colloid chemistry, sugar cookery, freezing, fruits and vegetables, jelly, gelatin, meat, emulsions, milk, egg cookery, wheat flour and bread, batters and doughs, and fats and oils. Laboratory outlines and extensive references to the literature accompany each chapter.

Report of activities of A. A. C. C. baking research fellowship, P. P. Merritt, M. J. Blish, and R. M. Sandstedt (*Cereal Chem., 9 (1932), No. 3, pp. 175–238, figs. 32*).—This is the final report of the laboratory activities of the first A. A. C. C. baking research fellowship project, a preliminary report on which has been noted previously (E. S. R., 66, p. 687). The report includes numerous additional studies and the general recommendations of the research fellow and his associates.

The cooking quality of potatoes, M. D. Sweetman (*Maine Sta. Bul. 360 (1931), pp. 194, 195*).—This is a progress report on factors affecting or correlated with mealiness in potatoes (E. S. R., 68, p. 273.)

Cooking tests with Lima bean flours, A. M. Field and E. Kaufman (*Jour. Home Econ., 24 (1932), No. 7, pp. 626–630*).—The authors report that the disagreeable beany flavor of Lima bean flour may be largely removed by heating the flour in shallow uncovered pans in an oven at 300° F. for 15 minutes and that the resulting flour may be used satisfactorily in a number of products. Recipes are given for Lima bean muffins and Lima bean flour soup, with suggestions for alterations in the recipes for spice cake and Boston brown bread when unheated or heated Lima bean flour is substituted for part or all of the usual wheat flour. Proximate analyses are reported for two samples of commercial Lima bean flour.

The utilization of calcium in soy bean diets, W. H. Adolph and S. C. Chen (*Jour. Nutrition, 5 (1932), No. 4, pp. 379–385*).—Calcium metabolism experiments on three adult Chinese subjects on diets in which the greater part of the calcium was furnished by milk and by soybean curd, respectively, are reported, with the conclusion that the calcium of the soybean curd is utilized as well as that of milk. There was better retention of calcium on a high than a low protein intake. The minimum daily calcium requirement for a Chinese adult of 55 kg body weight is estimated to be about 0.45 g.

Numbers of bacteria in frozen food stored at several temperatures, S. C. Prescott, P. K. Bates, and M. E. Highlands (*Amer. Jour. Pub. Health, 22 (1932), No. 3, pp. 257–262*).—In this preliminary report data are presented on the number of bacteria per gram in various quick frozen products at intervals

during storage at —6.6, —12, and —18° C. The materials included haddock, lamb chops, spinach, strawberries, raspberries, and orange juice.

In general the numbers of organisms were small and decreased on prolonged storage. The fluctuations in count were so great that no definite conclusions could be drawn, except that it was considered unlikely that any physical or chemical changes taking place in the products could be due to microorganisms. "In certain foods the decreases in numbers of bacteria occur more rapidly and to a greater degree at the higher storage temperatures, and this may be due to the lack of the protective action of extreme cold against the unfavorable environment provided the organisms by the foods."

A health aspect of frozen vegetables, R. P. STRAKA and L. H. JAMES (*Amer. Jour. Pub. Health, 22 (1932), No. 5, pp. 473–492, figs. 2*).—Peas were selected for an extensive investigation by the U. S. D. A. Bureau of Chemistry and Soils of the effect of freezing on the survival and toxicity of *Clostridium botulinum* spores and the possibility of development of botulinus toxin in vegetables which had been improperly handled after defrosting or when accidentally defrosted during storage or transportation. The present report deals with a part of the latter phase of the investigation.

The samples, amounting to a total of 1,200 containers, were packed, inoculated, and frozen at Seattle, Wash., and shipped to Washington, D. C., for study. Three methods of preparing the hand-shelled peas were followed—washing in cold water, washing in cold water and then blanching in boiling water, and washing in cold water followed by blanching in boiling brine. Four types of containers were used—No. 2 plain tin cans (sanitary type), rectangular 1-lb. cardboard boxes, wide-mouthed 16-oz. commercial glass jars equipped with metal friction caps for sealing under a vacuum, and 1-lb. cardboard tubs (circular) with cardboard tops. The peas in some of the containers were left uninoculated, others inoculated with less than 100 botulinus spores (mixed types A and B), and others with approximately 100,000,000 spores. The packing was done with vacuum (tin and glass containers only) and without vacuum. Four methods of defrosting were used—water bath at 43° C. with immediate examination, ice box for 3½ days, room temperature for 3½ days, and water bath at 43° until defrosted (2 hours) followed by cooking in 2.5 per cent brine and storing at room temperature for 3 days. Each test condition was selected because of some particular relationship either to the handling of the frozen peas or to the growth of *C. botulinum.*

In the final examination the peas were removed to sterile jars, crushed in the 50 c c sterile water used in washing out the container, and shaken vigorously. The liquor was used for the examination, which included determinations of total anaerobic bacteria and spore counts, isolation of *C. botulinum,* determination of pH, and toxicity tests on guinea pigs.

It is emphasized that toxin was obtained only in the defrosted samples that had been held at room temperature. All of these samples were definitely spoiled. No toxin was obtained from containers defrosted and examined immediately or from containers defrosted and held in an ordinary ice box.

Of 24 tin containers of uninoculated peas, most of which were held for 3 days after defrosting, 2 were toxic and 8 others yielded botulinus spores, 2 of which were obtained from samples examined immediately after defrosting. In 24 tin containers of lightly inoculated material held for the same length of time, 4 samples were toxic and of 24 heavily inoculated 8 were toxic. In cardboard containers, most of which were held for the same length of time (3 days) after defrosting, 2 of 16 uninoculated samples were toxic and 3 yielded botulinus cultures. Two of 16 lightly inoculated and 5 of 16 heavily inoculated samples were toxic. All of the uninoculated peas which developed toxin had been

blanched. The cultures isolated consisted of both type A and type B in approximately equal numbers.

The effect of dairy manufacturing processes upon the nutritive value of milk.—I, The apparent digestibility of fresh whole milk and of evaporated milk, W. B. Nevins and D. D. Shaw (*Jour. Nutrition, 5 (1932), No. 5, pp. 485–494*).—Fresh whole milk, milk evaporated in the laboratory from the same lot, and two brands of commercial evaporated milk were compared for completeness of digestion in paired feeding tests with albino rats, following the technic in feeding and management described previously (E. S. R., 64, p. 594).

No significant differences were found in the digestibility of the fat, sugar, and total solids of the fresh and the evaporated milk. The protein of the fresh milk was more completely digested than that of either the commercial or laboratory evaporated milk. These findings were confirmed when the feedings were reversed, showing that the lower coefficients for evaporated milk were not related to the individuality of the animals. "The differences in digestibility of fresh whole milk and of evaporated milk do not explain fully the differences in the nutritive properties of the two kinds of milk, since the evaporated milk proved superior for growth."

The addition of raw beef or meat scrap to a wheat-milk diet, W. C. Russell (*Jour. Nutrition, 5 (1932), No. 4, pp. 347–357*).—This contribution from the New Jersey Experiment Stations discusses certain improvements which have been made for breeding purposes in the Sherman diet B—one-third dried whole milk-two-thirds ground whole wheat, with sodium chloride to the extent of 2 per cent of the weight of the wheat. In preliminary trials a comparison was made of the original diet B and this diet supplemented by (1) 5 g of fresh, raw, lean beef per rat per day, (2) meat scrap fed first in 1- and later in 2-g daily amounts and after 4 months at a level of 10 per cent of the diet, and (3) 300 mg of dried yeast daily. Although only a small number of animals was used, the results showed that "growth of breeding stock to the mating age, reproduction, and growth of young are markedly better when raw beef or meat scrap is used with diet B. The meat scrap is equivalent to raw beef in these respects, and both are superior to dry yeast."

A more extensive comparison was then undertaken of diet B with the same diet supplemented by meat scrap, the constituents consisting of 60 per cent ground whole wheat, 30 per cent dried whole milk, and 10 per cent meat scrap (Swift's), with the addition of sodium chloride to the extent of 2 per cent of the weight of the wheat. Tabulated comparisons of reproduction and growth records, starting with 19 female rats placed at 28 days on each of the two diets, show a marked superiority of the animals on the supplemented diet in weight at 120 days of age, number of litters, number of living young, number surviving the first 7 days, and the average weights of the young at 7 and 21 days. The inclusion of the meat scrap caused an increase in the protein content from 19 to 22.02 per cent, in calcium from 0.33 to 1.19, and in phosphorus from 0.49 to 0.89 per cent, and in the Ca : P ratio from 0.67 to 1.34.

A further comparison is reported of the average weights of male and female rats at various ages as reported by Sherman and Campbell for diet B, by Macy et al. (E. S. R., 57, p. 390) for diet B supplemented by fresh cabbage or lettuce and with fresh cow's milk ad libitum for lactating animals, by Smith and Bing (E. S. R., 61, p. 694) for diet B modified by replacing one-half of the sodium chloride with calcium carbonate, feeding fresh lettuce daily, and supplying the lactating rats with 9 g of dried yeast per week, and the values obtained in the present study for diet B supplemented with meat scrap and with fresh meat.

Each of these modifications of diet B brought about an improvement in growth rate. The reason for the improvement is not known, but the conclusion

of Smith and Bing that the improvement observed in their colony was probably due to more favorable relationship between calcium and phosphorus, as well as to an alteration in the potential reaction of the diet, is thought not to hold, inasmuch as raw beef brought about as favorable a response as meat scrap, although furnishing no additional calcium and changing the potential reaction of the diet in the other direction from that of the diet of Smith and Bing. The possibility is suggested of a factor favorable to growth common to cabbage, lettuce, meat scrap, and raw beef.

The effect of figs and small amounts of raisins on urinary acidity, L. G. SAYWELL (*Jour. Nutrition, 5 (1932), No. 5, pp. 519–525*).—The investigation of the effect of the ingestion of grapes and grape products on urinary acidity (E. S. R., 67, p. 478) has been extended to the effect of a smaller amount of raisins and also of the common white Calimyrna fig, a strain of the Smyrna variety. The general plan followed was similar to that of the earlier study. The basal diet was the same except that in the raisin experiment the raisins were incorporated in the bread in such proportions that each pound loaf contained 5 oz. of raisins. The amount of bread ingested was such as to furnish 105 g of the raisins daily. This caused an increase in the pH of the urine of from 0.45 to 0.6 unit over that of the basal diet, this amounting to from 50 to 60 per cent of that noted in the previous study for 300 g of raisins. The increase in pH of the urine resulting from the daily ingestion of 330 g of figs ranged from 0.9 to 1.1 units, or a slightly greater change than that produced by an equivalent weight of raisins.

The increases in pH of the urine were accompanied as previously by corresponding decreases in ammonia excreted and in total acidity. These changes were greater for 300 g of figs than for 105 g of raisins and slightly greater than for 300 g of raisins.

Both figs and raisins caused an increase in the alkaline reserve, which was greater for the figs than the raisins. As in the previous study, there appeared to be a definite correlation between the alkalinity of the ash and the physiological reaction.

The organic acids of the raisins were completely oxidized and those of the figs to the extent of 97.5 per cent, as compared with only 92.8 per cent oxidation of the raisins in the previous study. "Consequently it would appear that for considerable quantities of natural grape and fig products the body is capable of completely oxidizing the organic acids. For larger quantities of the raisins only 92 to 95 per cent of the organic acids ingested may be oxidized."

The influence of diet on renal and blood vessel changes, F. BISCHOFF (*Jour. Nutrition, 5 (1932), No. 4, pp. 431–450*).—In this critical review of the literature on the subject, including both diet experimentation with laboratory animals and clinical work with human subjects, four diet constituents are considered separately—cholesterol, protein, acid ash, and vitamins. Much of the evidence presented is criticized on the ground of too drastic experimentation or too many uncontrolled variables. The final conclusion drawn is that "diet may have little to do with the spontaneous kidney and blood vessel changes observed in lower animals and with the cardiovascular renal diseases found in man. The progress of the research is at the stage where positive results are attained only by a degree of exaggeration which destroys their practical significance. A more thorough application of the statistical method and more carefully designed clinical experiments based on acceptable objective measures must be instituted in the study of diet in hypertension, arteriosclerosis, and nephritis."

Intermittency in growth as an index of health status, C. E. TURNER, E. LYTLE, and C. WINNEMORE (*Amer. Jour. Pub. Health, 22 (1932), No. 5, pp. 455–*

464, figs. 2).—In view of the present custom of paying less attention to comparisons of height and weight figures for school children with standard tables than to successive measurements on the same child, a comparison was made of the health habits of a group of 95 school children who failed to gain over a period of 3 months with those of a control group of 100 children who gained regularly. The children in the first group showed appreciably poorer health habits and lower health status than those who gained regularly. Nearly three times as many had two or more important unhygienic habits, serious physical defects were nearly three times as numerous, with nearly twice as many individual children having such defects, illness was nearly twice as common, and the number of children defective in two or all three of these respects was over four times as great in the first group as in the second.

The authors conclude that while intermittency in gaining weight does not distinguish sharply between children who seem to need attention and those who do not, it is more commonly accompanied by unsatisfactory health and that, therefore, it is worth while for teachers, school nurses, and school physicians to give such children individual attention.

The influence of muscular work on protein metabolism, H. E. C. Wilson (*Jour. Physiol., 75 (1932), No. 1, pp. 67–80*).—In attempting to solve the problem of the rôle of protein in muscular work, the total nitrogen and total sulfur output in the urine was followed in a single male subject 30 years of age and weighing 65 kg during four experiments on diets differing in the quality but not to any appreciable extent in the quantity of protein. In the first of these diets the principal source of protein was 100 g of cheese daily, in the second 50 g of cheese and 40 of gelatin, in the third 250 g of beef, and in the fourth four eggs daily. The rest of the diet consisted of bread 470 g, butter 100 or 125 g, jam from 150 to 250 g, and one apple daily. Each experiment consisted of a preliminary period, a work period, and a post-work period. The lengths of the work periods in the four experiments were 18, 5, 4, and 4 days, respectively. The work, which was done on a hand or bicycle ergometer for 1-hour periods daily, amounted to 22,000 kg m per day in the first two and 34,000 in the last two experiments.

The work time was prolonged in the first experiment in order to determine whether, with prolonged work, the rise in nitrogen output previously noted in the literature as occurring during a short period of work would fall with prolonged work. The nitrogen and sulfur outputs fluctuated considerably throughout the experiment, but rose to a maximum between the seventh and twelfth days of work and then fell gradually to a value below basal, rising slightly during the last three days. The S : N ratio of the maximum excess over basal values was 1 : 13.9 and fell to infinity at the close of the final work period. The retention on the first 3 days after work showed a S : N ratio approaching that of muscle tissue. These figures are interpreted as indicating that when work is commenced an increased rate of metabolism is initiated with katabolism tending to exceed anabolism up to a certain period after which katab- of nitrogen per 1,000 kgm of work.

That the increase in excretion of nitrogen and sulfur has no relation to the amount of work done, but is related to the quality of the protein ingested, is shown by the values of the excess output of both nitrogen and sulfur during the first 4 days' work in the four series of experiments, these being as follows: First experiment N 0.678 and S 0.028 g, second 0.507 and 0.037, third 0.371 and 0.066, and fourth 0.0 and 0.043 g, respectively. The total excess output of nitrogen for each experiment, including the period after work, divided by the total amount of work done gave values of 43, 37, 15, and 0 in terms of milligrams of nitrogen per 1,000 kg m of work.

The author concludes that the metabolic processes of the body should be considered as a whole. "The organism does not appear to metabolize protein, fat, and carbohydrate, each of them entirely independently of the other two. Rather it would seem that if the energy turnover is increased, the turnover of nitrogenous matter tends also to increase, and similarly when the turnover of nitrogenous matter is increased by means of additional dietary protein, a rise in the energy output follows, as is illustrated by the specific dynamic action of protein or indeed of any of the energy yielding foods. What the significance of this increase in nitrogenous metabolism during work may be is not certain, but it is possible that it is of advantage to the organism, particularly in relation to the muscular hypertrophy and improved physical well-being that ultimately follows prolonged training."

Muscle creatine in nutritional muscular dystrophy of the rabbit, M. GOETTSCH and E. F. BROWN (*Jour. Biol. Chem., 97 (1932), No. 2, pp. 549–561, figs. 4*).—"In this paper are reported the results of analyses for creatine, total nitrogen, moisture, and fat, carried out on 62 muscles obtained from 15 rabbits in various stages of nutritional muscular dystrophy [E. S. R., 66, p. 796] and on 28 normal muscles from 5 controls. Analyses of cardiac muscle, which remains normal in animals with severely degenerated skeletal muscle, have been included, as well as some determinations carried out on brain."

The data show an absolute as well as relative loss of creatine in the skeletal muscle, with no demonstrable loss in either brain or heart muscle in the animals suffering from muscular dystrophy. In the last stages of degeneration both the white muscle and red muscle contained from 110 to 250 mg of creatine per 100 g of tissue, an amount representing the normal creatine level in the heart muscle. The creatine concentration in the degenerated muscle was found to be independent of the fat content, which varied from 0.5 to 48 per cent. White muscle showed not only a greater reduction in creatine than red muscle, but more severe pathological lesions.

Vitamins: A survey of present knowledge ([*Gt. Brit.*] *Med. Research Council, Spec. Rpt. Ser. No. 167 (1932), pp. 332, figs. 34*).—This is the third edition of the monograph on vitamins noted from the first edition (E. S. R., 43, p. 262). In the present revision the committee appointed by the Medical Research Council jointly with the Lister Institute of Preventive Medicine consisted of E. Mellanby (chairman), H. Chick, K. H. Coward, J. M. Hamill, A. Harden, W. B. Hardy, F. G. Hopkins, R. A. Peters, O. Rosenheim, and S. S. Zilva. This committee was assisted in the preparation of the material for particular sections by W. R. Aykroyd, C. W. Carter, S. J. Cowell, M. A. B. Fixsen, E. M. Hume, G. F. Marrian, R. A. Morton, and M. H. Roscoe.

The order of treatment of the subject matter consists of an excellent historical introduction, followed by chapters on vitamin A, vitamin D, vitamins and dental tissues, vitamin E, the vitamin B complex (including in addition to vitamins B_1 and B_2 other factors not fully recognized by all investigators), pellagra as a vitamin deficiency disease, vitamin C, some nutritional aspects of cow's milk with special reference to the vitamins, vitamins and human diets, and vitamins in relation to the diet of the mother and the infant.

An extensive list of references to the literature is appended, together with a table of the qualitative distribution of vitamins A, D, E, B_1, B_2, the B complex, and C, and the full report of the League of Nations conference on vitamin standards (E. S. R., 67, p. 776).

A stock diet for rats bred for vitamin tests, K. H. COWARD, M. R. CAMBDEN, and E. M. LEE (*Biochem. Jour., 26 (1932), No. 3, pp. 679–690, fig. 1*).—Attention is called to the fact that diets satisfactory for rat colonies in one laboratory may not be as satisfactory in another. Difficulties encountered in attempts to

use the Steenbock stock diet (E. S. R., 50, p. 765) and the Sherman diet B are described, together with attempts, at first unsuccessful, to develop a new stock diet. The one finally adopted as the most satisfactory has the following composition: Ground yellow maize (corn) 65, ground whole wheat 20, "light white" casein (B. D. H.) 9, dried yeast 5, sodium chloride 0.5, and calcium carbonate 0.5 per cent. This is supplemented with 20 per cent dried milk added to the diet and 2 g each of fresh liver and of water cress per rat twice a week. The lactating does are given in addition 5 per cent of dried yeast, and during the third week of lactation the liver is omitted.

This diet is not completely satisfactory from the standpoint of fertility, but it is considered inadvisable to modify the diet to increase fertility as the young might thereby have too great a storage of vitamins. A definite seasonal variation in reproduction has been noted, which is accounted for by seasonal variations in certain constituents of the diet such as the fresh liver, water cress, and dried milk. No seasonal variations have been noted in the growth of the young rats on the diet.

The diet is considered satisfactory without further modifications for stock to be used in tests for vitamins B and G. For vitamin A work, liver is given only once and beef three times a fortnight. Rats weighing about 30 g are taken for the test and usually cease to grow at about 80 to 100 g weight. The milk bought in the open market in summer (England) is used than with dried winter milk. It is considered preferable, however, to use a limited supply of vitamin D reserves of young from colonies on this stock diet are higher if dried dried summer milk than to use winter milk continuously.

Standardised preparations of vitamins A and D (*Nature* [*London*], *130* (*1932*), *No. 3270, p. 32*).—Attention is called briefly to certain standardized preparations of vitamins A and D which have been prepared by British manufacturers for general clinical use. The preparations include pure crystalline vitamin D supplied by the British Drug Houses, Ltd., under the name of Radiostol Solution and Radiostol Pellets. The former is a tasteless preparation of the pure vitamin in oil of such activity that 1 fluid oz. is equivalent to 50 fluid oz. of cod-liver oil. The pellets contain the pure vitamin D in cocoa butter (one pellet being equivalent to a full adult dose of cod-liver oil). The other products noted are from the Glaxo Laboratories and include Ostelin, liquid and tablets, both prepared by the carefully controlled irradiation of ergosterol. The liquid is standardized to contain 5,000 international units of vitamin D per cubic centimeter and is said to be tasteless and miscible with water. The tablets contain 500 units of vitamin D each, together with neutral calcium glycerophosphate. Another product of the Glaxo Laboratories is Adexolin, a mixed preparation of vitamins A and D in proportions normal to cod-liver oil. This is available as a liquid and in capsules, the former being 20 times as active as a good cod-liver oil and largely free from the objectionable taste of ordinary fish liver oil concentrates.

Variation in growth response of rats in vitamin A tests compared with the variation in rats growing normally, K. H. Coward (*Biochem. Jour., 26* (*1932*), *No. 3, pp. 691–703, fig. 1*).—Data from 108 vitamin A tests involving 1,307 rats under similar conditions of basal diet, housing, etc. (E. S. R., 66, p. 591), have been subjected to statistical analysis in comparison with growth data for 469 normal rats to determine the degree of accuracy obtainable with reasonably small numbers of animals in general tests for vitamin A.

The standard deviation $\left(\delta=\frac{\Sigma d^2}{n-1}\right)$ of a single determination of the increase in weight of either bucks or does in a 5 weeks' growth test for vitamin A was found to be the same as that of the normal increase in weight for the same

period and beginning with the same average weight. The standard deviation (δ=14.72 for bucks and 11.02 for does) was the same whatever the mean increase or the average initial weight of the groups. The degrees of accuracy obtainable were within the same range whether the mean increases in weight and corresponding doses of the oil used as standard were low or high. For the same degree of accuracy about twice as many does as bucks must be used on account of the steeper curves relating the growth of bucks to the dose, which more than compensate for their greater standard deviations. The use of 8 bucks or 15 does for a vitamin A test is suggested. Formulas are given for determining significant differences in the mean increases in weight of any two groups of rats containing both bucks and does.

The influence of vitamin B_2 on carbohydrate metabolism [trans. title], J. A. Collazo and C. Pi-Suñer-Bayo (*Biochem. Ztschr., 250 (1932), No. 1–6, pp. 89–108*).—Disturbances in the carbohydrate metabolism of pigeons, previously noted as occurring in the absence of the vitamin B complex (E. S. R., 50, p. 163), are thought to be due to lack of vitamin B_2 rather than vitamin B_1. This conclusion was drawn as the result of a series of experiments on pigeons suffering from avitaminosis on a polished rice diet and treated with extracts of yeast autolysate, orange juice, and an acid plant extract in which vitamin B (B_1) and various enzymes had been destroyed by heating for three hours at from 100 to 120° C.

The vitamin C content of sheep-liver, with observations on the effects of freezing and storage, J. I. Mills (*Biochem. Jour., 26 (1932), No. 3, pp. 704–711, figs. 3*).—Determinations by the Höjer method and a curative method similar to the one described by Harris et al. (E. S. R., 67, p. 650) are reported for sheep liver in the fresh state and after freezing by a slow or quick process, storing for various periods of time, and slow thawing. It was found necessary to feed the liver as a water extract, as digestive disturbances resulted when the liver was fed directly.

The minimum protective dose of the fresh liver in the Höjer test was between 5 and 10 c c of the extract, equivalent to from 2.88 to 5.77 g of the liver. In the curative test 5 c c compared closely with 1 g of cabbage, a fully curative dose. Freezing either by a quick or slow process followed by thawing brought about a considerable decrease in the vitamin C content of the liver, and a still further loss occurred during storage at —19° C. for six months.

Attention is called to observations in the literature suggesting that the rat, chicken, and calf have the power of synthesizing vitamin C. It is thought possible that this is also the case with sheep. Of practical significance is the fact that in England large quantities of liver are imported in the frozen state.

Vitamin D and the conservation of calcium in the adult, I, S. W. F. Kletzien, V. M. Templin, H. Steenbock, and B. H. Thomas (*Jour. Biol. Chem., 97 (1932), No. 1, pp. 265–280*).—In this study of the vitamin D requirements of adult rats, two methods were followed. In one male and female rats were maintained on the Steenbock-Black rachitic ration 2965, with and without vitamin D, and in the other the Steenbock stock ration (E. S. R., 50, p. 765) with slight modifications was fed, with and without vitamin D, to female rats during the periods of reproduction and lactation. In both series the ash content of the fat-free femurs and the content of calcium and inorganic phosphorus in the blood were used as criteria. In the second series determinations were also made of the calcium content of the bodies of the newborn young.

In the first series both male and female rats on the rachitic diet containing an excessive amount of calcium over phosphorus had a very much lower percentage of ash in the femurs than the controls taken at the beginning of the

experiment and somewhat lower than that of the controls receiving vitamin D through irradiation of the diet. In the blood the values for calcium fell within the usual limits. In the males the phosphorus content of the blood of the rats on the rachitic diet without vitamin D was only about one-third, and with vitamin D about two-thirds, that of the stock animals. In the females the contrast was not quite as great, but the phosphorus content of the blood was considerably lower on the unsupplemented rachitic diet.

In the second series the antirachitic agent employed was irradiated dried yeast furnishing 1 Steenbock rat unit of vitamin D per milligram fed at a level of 0.5 per cent of the weight of the diet during the period of lactation. The litters were not reduced in size, and lactation was continued for 3 weeks. Certain rats which gave birth to litters but failed to nurse them were maintained on the D-deficient diet until after their second parturition. The ash content of the femurs was not reduced by two successive pregnancies unaccompanied by lactation, but was markedly reduced by lactation even when the diet was supplemented with generous amounts of vitamin D. The calcium content of the newborn young was fairly constant irrespective of the vitamin D additions to the mother's diet.

The authors conclude that in adult rats, kept for a long time on the rachitic ration 2965, "minimal amounts of vitamin D such as are formed by irradiation of the ration are effective in curbing but not entirely preventing losses of skeletal calcium and phosphorus." In regard to lactation, the failure of vitamin D to improve calcium balances, a situation comparable to that in heavily milking cows, is thought to indicate that "factors other than vitamin D dominate the calcium losses during lactation."

The effect of rachitogenic diets on the thyroid gland of the albino rat, J. Thompson (*Jour. Nutrition, 5 (1932), No. 4, pp. 359–377, pl. 1*).—An extensive series of observations on the thyroid glands of rats on unsupplemented and supplemented rachitic diets is reported, with the following conclusions:

Diffuse hyperplasia of the thyroid glands is produced in rats on the Steenbock rachitic diet or its various modifications. This hyperplasia is due not to the absence of vitamin D but to a deficiency of iodine associated with an excessive amount of calcium carbonate. The prevention of hyperplasia depends upon a favorable ratio between the iodine and calcium intakes. On the diets used, the addition of a small amount of potassium iodide was sufficient to prevent the condition.

The observations are considered of importance in connection with experimental rickets, in that the presence of thyroid hyperplasia complicates the situation through the withdrawal of calcium from the bones. "Although such a condition might actually favor the development of rickets, if one were testing various curative diets, a hyperfunctioning gland might actually deter the healing process."

Readily acid-hydrolysable phosphorus of the blood in infants with rickets, H. Bakwin, O. Bodansky, and R. Turner (*Soc. Expt. Biol. and Med. Proc., 29 (1932), No. 9, pp. 1238–1240*).—Blood phosphorus analyses are reported for 36 nonrachitic and 19 rachitic infants. The phosphorus fraction readily hydrolyzable by N mineral acid was found to be much lower in the rachitic than the nonrachitic subjects.

The relation of ultra-violet light to nutrition, I, II, H. Chick (*Lancet [London], 1932, II, Nos. 7, pp. 325–329, fig. 1; 8, pp. 377–384, figs. 3*).—In these lectures, delivered before the Royal College of Physicians of London in May, 1932, a concise historical account is given of the discovery of the relation of diet and light in prevention and cure of rickets and the clinical confirmation of this discovery, particularly the researches in Wien (Vienna) during 1919 to

1922 on rickets in children and hunger osteomalacia in adults, the investigations leading to the identification of vitamin D, and studies on the influence of vitamin D on mineral metabolism, its origin, nature, and distribution in foodstuffs, and factors influencing the dietary requirements for this vitamin. Extensive references are given to the literature on the subject.

The carbon arc as a source of artificial sunshine, ultraviolet, and other radiation, C. E. GREIDER and A. C. DOWNES (*Illum. Engin. Soc. Trans., 27 (1932), No. 7, pp. 637–653, figs. 16*).—"Data on the more common types of carbon arc lamp are presented, together with typical energy-distribution curves. A description is also given of the conditions under which each type of arc operates with respect to its own particular field of application, for industrial purposes as well as a source of ultra-violet radiation for the maintenance of health."

From the standpoint of maintenance of health, the most important type of carbon arcs described is the flame arc in which the arc stream rather than the electrode tips is the source of most of the radiations emitted. Two important carbons of this type are the "sunshine" carbons containing cerium in the core and the "C" carbons containing a mixture of metals, including iron, in the core. The former produces relatively large amounts of visual light and infra-red, together with moderate amounts of ultra-violet corresponding to that found in sunlight, and the latter high intensities of ultra-violet light with only moderate intensities of visual light and infra-red. In discussing the efficacy of sunshine lamps in place of sunlight, it is emphasized that the comparison should not be made with noon June sunlight, as the latter is too intense for heliotherapy. It is considered, moreover, that too much importance has been assigned to the antirachitic ultra-violet of wave length 2,900 to 3,100 a. u. In support of this statement, a private communication from A. F. Hess is quoted as follows:

"I believe that our endeavors should be directed toward duplicating sunlight, which we have every reason to believe is the most beneficient source of radiation for the maintenance and promotion of the health of growing children."

For the irradiation of milk, as reported by Supplee et al. (E. S. R., 67, p. 489), the C type arcs have been used, and for the irradiation of ergosterol B carbons which contain iron and are somewhat similar to the C carbons in their ultra-violet emission.

Further evidence of additional substances essential to mammalian nutrition, H. K. STIEBELING (*Soc. Expt. and Med. Proc., 29 (1932), No. 9, pp. 1155–1159, figs. 2*).—During the course of experiments on vitamin G, evidence along two lines was obtained of the existence of at least one other vitamin than the six generally recognized. The first type of evidence dealt with the supplementary nature of two sets of vitamin G-containing products and the second with unlike growth response of animals of different nutritional history during the latter part of the vitamin G test.

The first vitamin G-containing products tested consisted of an 80 per cent alcohol extract (at room temperature) of skim milk powder and the residue from this extract. The response to a mixture of equal parts of these materials as the source of vitamin G in the Bourquin-Sherman method (E. S. R., 66, p. 410) was greater during the latter part of the test period than to either of the materials fed separately. The growth response on the residue alone was greater than on the extract. This is thought to indicate that something other than vitamin G was lacking in the basal diet and was supplied in unequal quantities by the two fractions, the residue furnishing relatively more than the extract. In the second series of experiments matched rats depleted of their stores of

vitamin G were given a definite quantity of an 80 per cent alcohol extract of skim milk powder, a definite quantity of the filtrate left after treating with Lloyd's reagent an extract made from skim milk powder by boiling with 95 per cent alcohol, and a mixture of half the amounts of each of the two materials. The gains on the mixture were much greater than on either material alone, thus indicating that one of the materials was a relatively good source of vitamin G and a poor source of the new factor and the other the opposite.

The second line of evidence consisted of a comparison of the behavior during the latter part of a vitamin G test period of rats reared by mothers on the familiar one-sixth whole milk powder-five-sixths whole wheat and one-third whole milk powder-two-thirds whole wheat diets of Sherman. When the young from the mother on the latter diet were given graded portions of milk as the source of vitamin G after a preliminary depletion period, there was continuous and uniform growth throughout an 8-week test period. The other group showed the same growth for a few weeks, after which there was a flattening of the growth curve or decline in weight. Since the only difference in the two stock diets was the content of milk, it is concluded that milk is a fair source of the new factor, which is apparently less readily extracted by 80 per cent alcohol than is vitamin G.

References are given to reports in the literature on the existence of other factors than the six recognized vitamins essential for mammalian nutrition, but no attempt is made to establish the identity of the new factor described with any of these.

Botulism in North Dakota: Report of outbreak of thirteen fatal cases, R. W. Allen and A. W. Ecklund (*Jour. Amer. Med. Assoc., 99 (1932), No. 7, pp. 557–559*).—This is a clinical and bacteriological report on an outbreak of botulism occurring in North Dakota in January, 1931, with 13 fatal cases out of a total of 16 who partook of the infected food, a vegetable salad prepared from a mixture of diced carrots, peas, and cut string beans home canned by the cold pack method. The clinical diagnosis of botulism was confirmed by the identification of type A organisms from a section of the colon of one of the victims.

The authors urge that the greatest possible publicity be given to the proper procedure in the home canning of foodstuffs and their preparation before serving. It is also recommended that in any outbreak of botulism all individuals known or suspected to have eaten of the poisoned food should be given a preventive dose of a mixed type A and B botulinus antitoxin at the earliest possible moment, and that artificial respiration or the use of a respirator should be resorted to as a last measure in conjunction with botulinus antitoxin.

The glutathione content of anti-anaemic substances used in the treatment of pernicious anaemia, R. Fleming (*Biochem. Jour., 26 (1932), No. 2, pp. 461–463*).—This study is part of an investigation of several reputed blood-formation stimulants with respect to definite chemical substances which have been isolated from fresh liver. Attention is called to the presence of glutathione in appreciable quantities in liver, kidney, placenta, bone marrow, and blood corpuscles, and to observations of the author that in experimental anemic conditions in animals the glutathione content of the various organs varies considerably from the supposedly normal values. The examination of a commercial liver extract and a commercial desiccated extract of gastric mucosa for glutathione showed its presence, mostly in the oxidized form. Fresh gastric mucosa of the pig was found to contain 0.12 per cent of glutathione, 75 per cent of which was in reduced form.

HOME MANAGEMENT AND EQUIPMENT

Investigations of warm-air furnaces and heating systems, Part V, A. C. WILLARD, A. P. KRATZ, and S. KONZO (*Ill. Univ., Engin. Expt. Sta. Bul. 246 (1932), pp. 158, figs. 73*).—This is a progress report of investigations which are being conducted in cooperation with the National Warm-Air Heating Association (E. S. R., 61, p. 577). It describes a continuation of studies in the research residence at the station and deals with individual features of warm-air heating.

Studies of room air temperature conditions with warm-air registers located near the ceiling or near the floor showed that with gravity operation the high side-wall register combination in a second story room delivers from 15 to 20 per cent more heat through the register than the baseboard combination, for an equal supply of heat to the furnace. However, the additional heat was offset by the increased heat losses from the upper part of the room, and no increase in temperature of the air below the breathing level occurred.

It was found that a moderate outdoor temperature accompanied by a strong wind may produce as great a heating load as a materially lower outdoor temperature and a light wind. Thus the use of the degree-day basis only for estimating heating load or comparing the heating demands of different localities may be seriously in error unless the wind movement is substantially the same for the periods or localities compared. Serious consideration should also be given to sunshine or exposure effects on the heating requirements of rooms subjected to solar radiation.

Under summer conditions a furnace fan with a capacity sufficient to produce 3.5 recirculations per hour did not produce air velocities at the center of the room to exceed 9 ft. per minute. The increase in cooling effect was not appreciable and does not justify the cost of operating such a fan in the summer.

Studies with a steel furnace showed that anthracite coal can be burned more efficiently than bituminous coal. Bituminous coal can be fired most effectively in small charges and at short intervals, and requires the admission of auxiliary air above the fuel bed immediately after firing. This should be reduced to a minimum at the end of the cooking period.

The ratio of heating surface to grate area was found to have more influence in determining the relative performance of furnaces than the type of furnace or the material from which it is built.

Fuel economy in domestic automatic heating, H. H. LANGDON and H. J. DANA (*Wash. State Col., Engin. Expt. Sta., Engin. Bul. 39 (1932), pp. 46, figs. 11*).—This is a second progress report of tests on domestic heating plants conducted over a series of years (E. S. R., 64, p. 781). The conditions of the tests have included (1) a typical hot water heating plant, hand fired; (2) a typical hot water heating plant, stoker fired; (3) a typical hot water heating plant, stoker fired, and with an economizer added; and (4) a specially designed hot water heating plant, with stoker firing when operating under the following conditions: (*a*) Slow rate of coal feed and with clean heat exchanger, (*b*) fast rate of coal feed and with clean heat exchanger, and (*c*) fast rate of coal feed and with dirty heat exchanger.

It was found that owing to the inefficiency of hand-firing methods and to poorly designed heating plants only 30 to 40 per cent of the heat in coal ordinarily finds its way into the home. Automatic stoker firing raised the efficiency approximately 15 per cent. By incorporating an economizer in the heating plant to provide additional heat exchanger surface, 16 per cent of the heat in the coal was saved. The use of a properly designed furnace

with adequate heat exchanger surface showed an over-all efficiency, under normal operation, as high as 78 per cent. A dirty heat exchanger on the special test plant reduced the efficiency by 8 per cent.

A comparison was also made of the cost of heating a residence with coal in a stoker-fired heating plant and with oil in the same heater. With oil at 8.5 cts. per gallon, and coal at $8.50 per ton, the extra cost of heating a residence with oil as compared to stoker-fired coal in a typical heating plant amounted to 88.5 per cent.

Appendixes describe a special slow flow meter, and report data on heat absorption rates between the gases of combustion and the hot water of the system and on the rate of flow of water in the hot water system under varying operating temperatures.

Electrical cookery, P. S. GREENE and L. SMITH (*Maine Sta. Bul. 360 (1931), pp. 193, 194*).—This is a brief progress report on various problems of economy in the use of electricity for cooking, including the selection of utensils, types of burners, and choice of processes.

MISCELLANEOUS

Progress of investigations, abstracts of papers not included in bulletins, finances, meteorology, index (*Maine Sta. Bul. 360 (1931), pp. 165–231+IX, pl. 1, figs. 9*).—This bulletin contains, in addition to data not previously reported or noted elsewhere in this issue, a preliminary summary of economic information received in replies to a questionnaire from 1,802 dairymen in July and August, 1931, by G. F. Dow; data on paring waste of Maine potatoes, by M. W. Dow; and meteorological observations.

Fifty-fourth Annual Report of the North Carolina Agricultural Experiment Station, [1931], R. Y. WINTERS ET AL. (*North Carolina Sta. Rpt. 1931, pp. 130, figs. 11*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Forty-fifth Annual Report [of Pennsylvania Station], 1932, [R. L. WATTS ET AL.] (*Pennsylvania Sta. Bul. 279 (1932), pp. 27, figs. 5*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue. Meteorological data are also included.

Information regarding recent publications (*Kansas Sta. Circ. 165 (1932), pp. 4*).—This circular briefly describes Bulletins 251–256 and Circulars 158–163, previously noted, and Circular 164 noted on page 572.

NOTES

Georgia College and Station.—A tract of approximately 265 acres of forest land located on the college campus is to be converted into a demonstration forest. Most of the improvement work is to be done by forestry students as laboratory assignments.

At the station Dr. William A. Hartman and J. J. Morgan of the U. S. D. A. Bureau of Agricultural Economics established headquarters on December 15, 1932, to conduct work on the land utilization and long-time rural development project in cooperation with regents of the university system of Georgia.

Kansas Station.—A laboratory building at the Fort Hays Substation for crop and soil investigations was completed in December, 1932. The building is 42 by 54 ft., two stories with basement, and was erected at a cost of $10,500. There are four main laboratory rooms in the basement, two of which have been fitted up for chemical work, five laboratory work rooms on the first floor, and a large storage room for crop material on the top floor. The building provides space for laboratory work on cereal and forage crops and dry-land agriculture conducted in cooperation with the U. S. D. A. Bureau of Plant Industry and for soil investigations in cooperation with the Bureau of Chemistry and Soils.

Massachusetts Station.—Ex-president R. W. Thatcher of the college has been appointed research professor in plant and animal chemistry, effective April 1.

Dr. Glen L. Dunlap, assistant research professor in veterinary pathology, has resigned to continue graduate work at the University of Michigan. Dr. Henry Van Roekel, chief of the pullorum disease control laboratory, is on leave of absence for graduate work at Yale University. Dr. K. L. Bullis has been placed temporarily in charge of the laboratory, with Dr. D. M. Yegian as assistant veterinary pathologist.

Michigan College.—The college dairy building, erected in 1910, has been completely remodeled. A basement has been placed under the entire structure. Additional classrooms and a nutrition research laboratory have been added, and other changes have been incorporated which increase the available space and facilities materially.

Minnesota Station.—The new agronomy field house, for which $30,000 was appropriated by the legislature, was formally dedicated January 18 as a part of the program of Farmers and Home-Makers' Week. The building was accepted by Vice Director Andrew Boss, who discussed the beginning of plant breeding at the station and its development and progress during the 40 years of active work in this line.

Vermont University.—Under the will of the late Hon. C. W. Waterman, United States Senator from Colorado, who died August 27, 1932, securities of a present market value of nearly $1,000,000 are placed in trust, the income to be conveyed to his wife and the securities to be transferred upon her death to the university. With 90 per cent of the proceeds the university trustees are directed to erect a Waterman memorial building for such educational purposes as they may determine, and the remaining 10 per cent of the fund is to be invested and utilized solely for the maintenance, repairs, upkeep, and renewal of the building and its equipment.

Senator Waterman was a graduate of the university in the class of 1885 and a trustee from 1921 to 1925. He received the LL. D. degree from his Alma Mater in 1922.

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UNITED STATES DEPARTMENT OF AGRICULTURE
OFFICE OF EXPERIMENT STATIONS

Vol. 68 MAY, 1933 No. 5

EXPERIMENT STATION RECORD

By direction of the Secretary of Agriculture, the matter contained herein is published as administrative information required for the proper transaction of the public business

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EXPERIMENT STATION RECORD

EDITOR: HOWARD LAWTON KNIGHT

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EXPERIMENT STATION RECORD

VOL. 68 MAY, 1933 NO. 5

EDITORIAL

PERSONNEL CHANGES IN THE OFFICE OF EXPERIMENT STATIONS

Under the practically mandatory provisions of the Economy Act of 1932, Dr. Walter H. Evans, chief of the Division of Insular Stations and principal botanist in the Office of Experiment Stations, and Mr. William E. Boyd, assistant botanist, have been retired from active service. Dr. Evans attained the prescribed age limit of 70 years upon January 3, 1933, and Mr. Boyd on February 20, and their retirements became effective at the close of these respective months.

As a result of these retirements, the Office of Experiment Stations loses the services of two members of its staff of extended experience and much specialized knowledge. Dr. Evans became associated with the Department in 1891 as a special agent in botany. Two years later, when a topical arrangement of abstracts in *Experiment Station Record* was substituted for the previous institutional classification, he was assigned to the sections of seeds, weeds, and diseases of plants, and for the ensuing 40 years continued in charge of its botanical interests. For the first 17 years of this long period he prepared personally all abstracts in this field, and thereafter nearly all of those originating in the publications of the State experiment stations and the U. S. Department of Agriculture, as well as many from other sources, were likewise from his pen. The total number of these abstracts must be reckoned by the tens of thousands, and his continuity of service was such as to present an unrivaled opportunity for familiarity with the upbuilding during the past half century of research in plant physiology and pathology in their relations with agriculture. This knowledge was freely drawn upon from time to time for special summaries and reports, contributions to dictionaries and encyclopedias, and for much technical advice in connection with experiment station projects in these important fields.

The assistance in abstracting rendered by Mr. Boyd began in 1911. A botanist of sound fundamental training and a well-equipped linguist, he likewise contributed to the sections of Agricultural Botany and Diseases of Plants many thousands of abstracts, including nearly all of those derived from sources outside the United States, and in-

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volving an unusual number of foreign languages. His unbroken service of over 21 years was noteworthy for his thoroughness in the scrutiny and correlation of material, his meticulous care in the preparation of his abstracts, and his assiduous devotion to the work.

The services of Mr. Boyd were confined exclusively to the *Record*, but those of Dr. Evans were utilized practically from the beginning quite extensively in other capacities as well, many of high responsibility. He represented the Office in the preparation and installation of the cooperative experiment station exhibits at the Paris Exposition in 1900, as well as the plant laboratory exhibits of station work at the St. Louis Exposition in 1904. He had a large share in the annual visitation of the stations by representatives of the Office in connection with the administration of the Hatch, Adams, and Purnell Acts. In the absence of the administrative head of the Office he assumed temporary charge of its work on many occasions, and upon the death of Dr. E. W. Allen in 1929 served as acting chief during the ensuing interim for nearly two years.

The activity with which he was most conspicuously identified, however, was in connection with the administration of the so-called insular experiment stations. Following a botanical survey which he made in Alaska in 1897 and the completion of agricultural explorations there by others, the undertaking of experimental work in that Territory was authorized in 1898, and an experiment station was located in Sitka but operated under his supervision. Stations similarly administered were established in Hawaii and Puerto Rico in 1901, Guam in 1908, and the Virgin Islands in 1919. Considerable development and expansion ensued for all of these stations, the high-water mark in their Federal appropriations for maintenance reaching $269,000 per annum. The administration of this unique enterprise at long range and under a wide diversity of conditions brought many complex and unusual problems for solution, and much of the substantial success which has been attained must be attributed to the personal efforts of Dr. Evans.

During the interval prior to the filling of the vacancies which have been created, business pertaining to the insular stations is being conducted directly by the chief of the Office. Temporary provision has been made for the abstracting for the *Record* of the botanical literature published by the Department and the State experiment stations, so far as is practicable, mainly by Mr. J. W. Wellington, horticulturist, and Mr. H. M. Steece, agronomist. Under this plan, Mr. Wellington, who abstracted all of this literature during the emergency following the death of Dr. Allen, has been assigned those publications dealing with physiological and pathological investigations of horticultural and forest plants, while Mr. Steece will cover those studies involving field crops.

Mention should also be made of the establishment in the *Record*, begining with the April issue, of a section of rural sociology. This section will be in charge of Dr. B. Youngblood, who has for some time been contributing to the *Record* along economic and sociological lines, and will have the continued assistance of Mr. F. G. Harden. This segregation of the sociological studies into a distinct section has long been under consideration, and while space limitations will doubtless continue to defer full utilization of the large amount of bibliographical material already available in the field, the action taken is intended as a formal recognition of the importance and essential solidarity of rural sociology as a subject of research. It is in keeping with the increasing emphasis which is being placed upon such studies in the solution of current problems. As an editorial in a recent issue of *Nature* indicates, "the evidence suggests that one of the most urgent needs of to-day is an adequate attack on the social sciences and a determined attempt to place sociology, economics, and psychology on a really scientific basis. . . . It is highly probable that the most important contributions of science to human welfare during the next few decades will come from such fields as these." It is the hope of the *Record* to give all possible aid along these lines.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

[Chemical researches of the New York State Station] (*New York State Sta. Rpt. 1932, pp. 27, 44, 48, 49*).—Data are briefly noted as to the effects of salts on gelatin, the chemistry of pectin, and the sterilization of fruit juices with the Seitz germ-proofing filter.

Colloid aspects of food chemistry and technology, W. Clayton (*Philadelphia: P. Blakiston's Son & Co., 1932, pp. VIII+571,* [*pls. 6*], *figs.* [*54*]).—This book "is not a treatise on food technology, but rather an introductory guide to those aspects and problems of a colloid nature which may be unfamiliar to the food chemist who has not specialized in colloid chemistry and physics." The author has "assumed an elementary knowledge of colloid chemistry, and apart from a very brief introduction dealing with the scope of the present-day position of the science, colloid concepts are developed not according to a regular discipline but as and where main points of interest arise. At the same time, the order of the chapters follows the usual study of colloid systems."

The chapter headings are: The scope of colloid chemistry, agar-agar and gums, the chemistry of proteins, gelatin, colloids in cereal chemistry, emulsions, the colloid chemistry of milk and milk products, colloid aspects of nutritional chemistry, colloid problems in sugar technology, fruit jellies, jams, and marmalades, colloid phenomena in brewing, the freezing and thawing of colloid systems, and the treatment of water and factory effluents. To these are added a glossary of terms, a bibliography, an author index, and a subject index.

Adulteration and analysis of foods and drugs, J. F. Liverseege (*London: J. and A. Churchill, 1932, pp. XV+599, figs. 4*).—This work on the sampling and analysis of materials coming under the purview of the British Food and Drugs Act is "an account of the analytical methods, research, and memoranda which have been found useful during . . . [the author's] forty-three years' experience in the Birmingham Municipal Laboratory."

The contents are: Administration—general, sampling, and records; public analysts' certificates; prosecutions and evidence; general methods of analysis; normal mineral constituents; coloring matters and metallic impurities; preservatives; methods of calculation; microscopy of starches; starchy foods; sugar analysis; sugar, treacle, confectionery, jam, and jelly; medicinal sirups—honey and preparations; milk—condensed, dried, and buttermilk; analysis of oils, fats, and waxes; butter, margarine, and cream; fixed oils, fats, and waxes; nitrogenous foods; fresh and preserved fruits, seeds, etc.; tea, coffee, cocoa, and chocolate; aerated drinks and distilled water; alcohol; beer and spirits; wines, cordials, and medicated wines; acid foods and tartrates; spices and sauces; effervescent foods and drugs; miscellaneous foods; alkalies, carbonates, and sulfates; natural drug products; medicinal powders; essential oils, medicinal spirits, and tinctures; drugs in doses—pills, capsules, tablets, and lozenges; external remedies; miscellaneous drugs; and dispensing. An appendix takes up the standardization of volumetric apparatus, the preparation of test solutions, etc.

Technology of the physics and chemistry of cellulose, H. Mark (*Physik und Chemie der Cellulose. Berlin: Julius Springer, 1932, pp. XV+330, figs. 145*).—Part 1 of this work takes up the mechanical properties of cellulose and its derivatives in the solid state, the properties of solutions of cellulose and its derivatives, and the optical behavior of cellulose and its derivatives in the solid and in the dispersed condition. Part 2 contains general statements on the reactions and characteristics of micellar systems; the preparation of purified cellulose, and its separation from accompanying substances; the influence of alkalies upon cellulose; the effect of heavy metal-ammonia complexes upon cellulose; the effect of salt solutions on cellulose; the effect of carbon disulfide and of alkali upon cellulose; the effect of acids upon cellulose; the cellulose ethers; and the hydrolysis of cellulose.

Attempted photosynthesis of carbohydrates in vitro with visible light, F. P. Zscheile, jr. (*Jour. Amer. Chem. Soc., 54 (1932), No. 3, pp. 973–976*).—Report is made in a contribution from the University of California upon attempts to repeat Baly's experiments (E. S. R., 60, p. 518), "in which he claims to have synthesized carbohydrates in vitro from carbon dioxide and water, using the carbonates of nickel and cobalt as catalysts, suspended in water saturated with carbon dioxide and illuminated by visible light.

"Special precautions were taken to purify the carbon dioxide used, and Benedict's test was used for the detection of carbohydrates. The results were all absolutely negative."

Hexuronic acid as the antiscorbutic factor (*Nature [London], 129 (1932), No. 3269, p. 943*).—Under this title are included brief notes by S. S. Zilva and A. Szent-Györgyi. The former states that he has obtained results with hexuronic acid from adrenal glands as an antiscorbutic agent similar to those obtained by Svirbely and Szent-Györgyi (E. S. R., 67, p. 649), but that in his opinion this does not afford sufficient evidence of the identity of hexuronic acid with the antiscorbutic factor. In reply to this, Szent-Györgyi states that the antiscorbutic activity of crystallized hexuronic acid in the dosage used by Zilva constitutes indisputable evidence that hexuronic acid is identical with vitamin C.

Some substituted phenols and germicidal activity, R. R. Read and E. Miller (*Jour. Amer. Chem. Soc., 54 (1932), No. 3, pp. 1195–1199*).—Having prepared a number of ring substituted phenols and having determined the bactericidal phenol coefficients of these compounds, the author reached the tentative conclusion that "the mass of a group substituted into a phenol has little relation to the germicidal activity of the resulting compound. Position isomerism has little effect on the bactericidal activity of alkyl and alkoxy substituted phenols. Side chain isomerism affects the activity of alkyl phenols markedly. The more compact the group the lower the activity. The group CH_2R is much more effective than OR in enhancing the activity of a phenol. The carbomethoxy and acetoxy groups are ineffective in enhancing the activity of phenol."

Mechanical shaking device, O. W. Chapman and F. Cinotto (*Indus. and Engin. Chem., Analyt. Ed., 4 (1932), No. 1, p. 126, fig. 1*).—A description of a simple device readily and cheaply constructed in the laboratory and capable of imparting a circular-oscillatory motion to a circular platform carrying several flasks, is presented, with a figure showing the essential constructional features. Operation of the shaker by means of a friction drive stirrer motor permitted regulation of speed, and the amplitude of the oscillation was controlled by varying the distance of the point of attachment of the drive arm

(connected to the motor through an eccentric) from the center of the circular oscillation.

A bicycle-chain stirrer, S. B. Lippincott (*Indus. and Engin. Chem., Analyt. Ed., 4 (1932), No. 1, p. 93, fig. 1*).—A stirrer to scrape the wall of a flask clean was made from a short piece of ordinary bicycle chain. A hole was drilled through the middle link and an iron rod was fitted into the link. The whole was then drilled through rod and link and pinned in the position bringing the smooth side of the chain against the glass. The rod could be passed through a mercury seal; and the apparatus was useful "in any case where it is desired to keep a solid worked free from the wall of a flask and an ordinary stirrer fails to do so," except in cases in which iron would interfere with the reaction. Among several advantages noted is the fact that this form of stirrer will operate smoothly even when its shaft is not parallel with the axis of the flask.

Automatic apparatus for intermittent washing, B. H. Carroll (*Indus. and Engin. Chem., Analyt. Ed., 4 (1932), No. 3, pp. 323, 324, figs. 2*).—A clock-controlled device, of which a distinctive feature is the use of a stock two-way stopcock turned by a small motor which can be controlled directly by clock contacts, is described. Mechanical and wiring diagrams are included.

Improved unit for removal of solid particles from gas streams, R. C. Stratton, J. B. Ficklen, and E. W. Krans (*Indus. and Engin. Chem., Analyt. Ed., 4 (1932), No. 3, p. 334, figs. 3*).—A gas-washing unit which successfully overcame difficulties encountered in attempts to use apparatus of the usual type was simply constructed from a hydrometer jar carrying an inlet tube of which the lower end was inserted through a rubber stopper into a porcelain Gooch crucible so placed in assembling the unit that the perforated bottom of the crucible was held at a distance of 10 mm from the bottom of the jar. The washed gas passed out of the apparatus through the usual short right-angled tube.

Device for removing "frozen" plugs from stopcocks, H. W. Bailey (*Indus. and Engin. Chem., Analyt. Ed., 4 (1932), No. 3, p. 324, figs. 2*).—Noting that the devices thus far offered for this purpose are in general not readily adapted for use on stopcocks of varying size and are not readily applied to stopcocks in difficultly accessible places, the author describes two forms of apparatus designated respectively the "wheel-puller" type and the "clamp" type, which overcome the difficulties named and are of simple construction.

A device for increasing the effectiveness of freezing mixtures, R. C. Archibald (*Jour. Amer. Chem. Soc., 54 (1932), No. 10, pp. 3886, 3887, fig. 1*).—The author of this contribution from the University of California describes a device which overcomes in large measure the difficulty usually encountered in attempts to obtain temperatures below —15° C. by means of ice and salt mixtures. A temperature of —20.5°, only 0.6° above the eutectic temperature, was reached in 30 minutes and maintained until practically all of the ice had melted; a period of about 24 hours.

The apparatus consists of two concentric cylinders made of 8-mesh per inch (3-mesh per centimeter) wire screen with a common bottom of the same material made to fit easily inside of a standard 1-gal. wide-mouthed vacuum food jar. "Crushed ice is placed in the vacuum jar and rock salt (sodium chloride) in the annular space in the basket. The jar is then filled well up in the basket with brine or water. If water is used to start, rather than brine, the ice tends to cake together at first. If one breaks this cake after a few minutes, however, the action proceeds as if brine were used. Convection starts immediately, the dense, concentrated brine moving downward next to the walls and the colder, more dilute brine rising in the center."

A precision sodium cutter, E. B. Hershberg and E. H. Huntress (*Indus. and Engin. Chem., Analyt. Ed., 4 (1932), No. 1, pp. 100, 101, figs. 3*).—This contribution describes a cutter capable of producing uniform pellets of sodium from pressed wire, those cut from 5-mm wire to have a weight of 200 mg being uniform to 1 per cent or less. An adjustable stop permits setting the device for the required weight per pellet. The cutting edge is provided by a replaceable safety razor blade. The construction of the apparatus is shown in detailed working drawings, and its manipulation is described.

Fractionating column for use under diminished pressure, M. T. Bush and A. M. Schwartz (*Indus. and Engin. Chem., Analyt. Ed., 4 (1932), No. 1, pp. 142, 143, figs. 2*).—The device of which the description and constructional diagram are presented in this contribution from Cornell University provides against excessive heat loss from the column and brings the temperature of the column under control by surrounding the column proper with a chromel wire electric heating unit, and the column and heating element with an evacuated jacket. A simplification and improvement of the mercury valve of the flow divider is described; and the fractional distillation receiver is also discussed.

A modified microburet, R. B. Dustman (*Indus. and Engin. Chem., Analyt. Ed., 4 (1932), No. 3, pp. 345, 346, fig. 1*).—Essentially, the apparatus described in this contribution from the University of West Virginia consists of burettes of two types, each with its own stopcock and having a common connection to a single stopcock and tip and to the refilling tube. Of the two burettes thus combined, one is the usual microburette, the other a series of bulbs with graduations on the constrictions between each two of the four bulbs. From mark to mark each bulb is represented as having a capacity of 3 c c. The main burette is graduated from 0 to 5 c c in divisions to 0.02 c c. The approximate dimensions are given in detail and the manipulation is described.

Improved apparatus for micro-electroanalysis, B. L. Clarke and H. W. Hermance (*Jour. Amer. Chem. Soc., 54 (1932), No. 3, pp. 877–885, figs. 4*).—Cells of two types, the one for the treatment of a few cubic centimeters of solution, the other for the treatment of several hundred cubic centimeters, are described and illustrated by drawings. Both cells are designed to permit the separation of extremely small quantities of metallic ions from solution, report being made in the paper upon determinations in the larger cell of traces of zinc in aluminum sulfate solutions, traces of lead in zinc sulfate and in nickel nitrate solutions, traces of copper in water and in nickel nitrate solutions, and impurities in "chemically pure" reagents; while in the small cell determinations of traces of nickel, of tin, and of zinc were made.

The stick antimony electrode: Preparation and calibration, L. R. Parks and H. C. Beard (*Jour. Amer. Chem. Soc., 54 (1932), No. 3, pp. 856–864, fig. 1*).—Measurements at the Pennsylvania State College indicated that the use of a vacuum-tube potentiometer with stick antimony electrodes eliminates drifting of the potential and gives rapid, constant, and reproducible readings under suitable conditions and within the natural limits of this electrode system.

Stirring of a solution or the bubbling of a gas through it caused a deviation of the readings from the theoretical values, but the stick antimony electrode in an unstirred solution in contact with air and at equilibrium with both antimony and antimony trioxide gave correct measurements from pH 2 to 7, inclusive. The value of E with this electrode measured against the normal calomel electrode was found to be represented by the equation $E=+0.030+0.5915$ pH.

A new type of electrolytic cell, G. I. Whitlatch and R. D. Blue (*Indus. and Engin. Chem., Analyt. Ed., 4 (1932), No. 3, pp. 338, 339, fig. 1*).—The authors

describe the composition and construction of a 3-compartment cell for electrochemical operations. The clay mixtures for both box and diaphragms are given, and the forming, glazing, and firing of the apparatus are detailed. The diaphragms being sealed into place by the glaze, and the glaze itself being resistant to most acids and alkalies, the cell could be used for heated, and for strongly alkaline, solutions.

The photovoltaic cell as indicator in precise titrometry, H. M. PARTRIDGE (*Indus. and Engin. Chem., Analyt. Ed., 4 (1932), No. 3, pp. 315–317, figs. 4*).—In the method reported, "precision of one part per thousand is obtained with three titrations. Under the most favorable conditions only five readings for each determination are necessary, and the end point is obtained by extrapolation." The nature of the set-up is indicated in a diagram and the apparatus and manipulation are described.

Rapid method for fixing end point of potentiometric titration, F. FENWICK (*Indus. and Engin. Chem., Analyt. Ed., 4 (1932), No. 1, pp. 144–146, figs. 2*).—A simple mathematical formula for determining the end point of a potentiometric titration is given. It is noted that the expression is applicable only in cases in which the electron interchange between the electromotively active ions and the indicator electrode is the same on both sides of the end point, and that it assumes that a cubic equation fits the titration data accurately near the point of equivalence. Its use, however, "reduces the necessary plotting to a minimum, thereby shortening the time required for an analysis. The formula has been applied to a specific titration selected from the group to which its use is theoretically least restricted, i. e., neutralization reactions. The results were found to compare very favorably in accuracy with the experimental data."

A double capillary method for the measurement of interfacial tension, G. L. MACK and F. E. BARTELL (*Jour. Amer. Chem. Soc., 54 (1932), No. 3, pp. 936–942, figs. 4*).—This contribution from the University of Michigan describes two new types of apparatus for interfacial tension measurements by the capillary rise method. "These are the only methods so far devised for securing accurate values of the interfacial tensions where only small amounts of the liquid are available." The first type of apparatus gave good results without requiring a careful determination of the density of the organic liquid. The second type gave very accurate results in the case of substances of which the density was known or could be determined with precision. The interfacial tension values of a number of standard reference liquids were determined with the apparatus, the results showing good agreement "with the most generally accepted of those reported in the literature."

Removal of color from solutions to be examined by color comparisons, P. L. HIBBARD (*Indus. and Engin. Chem., Analyt. Ed., 4 (1932), No. 3, p. 283*).—A note contributed from the University of California decribes the following procedure as useful in preparing soil extracts for the colorimetric phosphate determination (E. S. R., 44, p. 611), and similar work.

To 50 c c of the colored solution add 5 c c of saturated solution of bromine and 5 drops, or enough to make alkaline, of 5 N sodium hydroxide. Add 5 drops of 5 N hydrochloric acid, or other suitable acid, to reacidify the solution. "Free bromine should now be apparent; if not, the treatment should be repeated from the first." Add 5 c c of a 5 per cent solution of sodium sulfite to reduce the bromine and leave the solution colorless. "The bleaching action seems to take place mostly at the moment the bromine is liberated by adding acid to the sodium hypobromite first formed."

Quantitative spectrographic studies of co-precipitation.—I, Magnesium in calcium oxalate, S. Popoff, L. Waldbauer, and D. C. McCann (*Indus. and Engin. Chem., Analyt. Ed., 4 (1932), No. 1, pp. 43–46, fig. 1*).—This method was shown to be applicable throughout a range of 1 to 0.001 per cent magnesium "and may, by further refinements, be extended to even lower concentrations."

It was found that magnesium contamination depends primarily upon the time of digestion after the solution has been made alkaline, and in part, also, upon the time of precipitation and the quantity of ammonium oxalate present, but is practically independent of the ammonium chloride content. The complete precipitation of the calcium was found to require the presence of ammonium oxalate sufficient for both calcium and magnesium.

Bi-ortho-anisidine as internal indicator in bichromate method for iron, M. E. Weeks (*Indus. and Engin. Chem., Analyt. Ed., 4 (1932), No. 1, pp. 127, 128*).—Noting the undependability of *p*-phenetidine and some similar internal indicators of the end point in oxidative titrations of ferrous iron, in that color change occurs before the true end point is reached unless a freshly prepared solution of the indicator be used, the author proposes the substitution for these unreliable compounds of a 1 per cent solution of bianisidine in glacial acetic acid.

"The solution obtained by dissolving the weighed sample [of Mohr's salt] in 30 c c of 7 N hydrochloric acid was heated to the boiling point and carefully reduced with stannous chloride. After addition of one excess drop of stannous chloride, the iron solution was quickly diluted to 400 c c with distilled water which had been cooled on ice. After adding 12 c c of a mixture containing equal volumes of concentrated phosphoric acid and concentrated sulfuric acid, exactly 10 drops of the 1 per cent solution of bianisidine, and 30 c c of a saturated solution of mercuric chloride, the iron solution was immediately titrated with the standard solution of potassium bichromate until the color passed through brownish green to red-brown. If the standard solution is added slowly toward the end, the color change is very distinct and the titrations can be duplicated very accurately. After standing a few minutes the titrated solutions acquire a blood-red color."

Titration of zinc with potassium ferrocyanide, I. M. Kolthoff and E. A. Pearson (*Indus. and Engin. Chem., Analyt. Ed., 4 (1932), No. 1, pp. 147–150*).—The authors of this contribution from the University of Minnesota report a systematic examination of the method of the titration of zinc with potassium ferrocyanide using diphenylamine or diphenylbenzidine as an indicator. "The results obtained are mainly dependent upon the conditions of titration (speed of adding ferrocyanide, temperature, direct of back titration); the most favorable acidity and concentration of ammonium sulfate being 0.5 to 1.5 N and at least 1 to 2 per cent are of minor importance." It was found, also, that with the use of diphenylbenzidine no indicator correction had to be applied, whereas with the use of 1 per cent diphenylamine 0.033 c c of 0.025 M ferrocyanide per 1 drop of indicator (0.023 ml) had to be added as a correction to the final titration figure.

Rinnmann's green test for zinc, A. A. Benedetti-Pichler (*Indus. and Engin. Chem., Analyt. Ed., 4 (1932), No. 3, pp. 336, 337, fig. 1*).—"Rinnmann's green test for zinc can be carried out in a very simple way by placing a drop of the test solution on a piece of filter paper impregnated previously with potassium cobalticyanide, drying, and ashing the paper; 0.0006 mg of zinc still produces a disk of green ash on the spot where the solution had been added. The test is best carried out with a solution obtained by dissolving the zinc sulfide precipitated in the course of a separation in nitric acid."

A new microanalytical test for carbon disulfide, N. Tischler (*Indus. and Engin. Chem., Analyt. Ed., 4 (1932), No. 1, p. 146*).—In accordance with the direction given in this contribution from the Iowa State College, to test for the presence of carbon disulfide, 1 c c of diethylamine solution (1 per cent, by volume, diethylamine in absolute alcohol) and 5 drops of copper acetate solution (0.05 per cent, by weight, copper acetate C. P. in absolute alcohol) are added to 1 c c of the solution to be tested. Colorless solutions in acetone, chloroform, ether, and alcohol gave a golden-yellow color at a carbon disulfide concentration of 1 to 100,000, a pronounced yellow at 1 to 500,000, and a faint but perceptible tinge at 1 to 1,000,000. In aqueous solutions, a precipitate was formed, but the sensitiveness remained the same. "Dimethylsulfide and ethyl mercaptan, pure and 1 to 100, failed to give the reaction. However, pure thioacetic acid gave a similar reaction to carbon disulfide, and it is suggested that the test is possibly applicable to double-bonded sulfur compounds generally."

Distillation methods for determination of sulfur dioxide, P. F. Nichols and H. M. Reed (*Indus. and Engin. Chem., Analyt. Ed., 4 (1932), No. 1, pp. 79–84, figs. 6*).—Testing the effects of modifications in various details of the general method, the authors of this contribution from the University of California note, among other findings, that rapid heating generally gave more uniform results than slow heating; that electric heaters furnished more uniform heat than gas, and also reduced foaming; that, other things being equal, hydrochloric acid of the same normality liberated sulfur dioxide faster or more completely than did phosphoric acid, and that larger concentrations of either liberated sulfur dioxide faster or more completely than lower concentrations, within the limits tried; that no definite end point in the distillation was reached; that agreement between gravimetric and volumetric determinations was good when the same oxidant was used; and that the use of sodium acid carbonate with either acid increased the yield of sulfur dioxide from dried fruits by about 50 parts per million, but made no significant change in the yield from sulfurous acid solutions.

"Among the methods tried, the gravimetric Monier-Williams method [E. S. R., 61, p. 312] gave the highest consistent recovery for sulfur dioxide from sulfurous acid solutions."

Electrometric titration of boric acid, L. V. Wilcox (*Indus. and Engin. Chem., Analyt. Ed., 4 (1932), No. 1, pp. 38, 39*).—The author of this contribution from the U. S. D. A. Bureau of Plant Industry gives full manipulative detail of a titration of boric acid by means of quinhydrone electrode with which a silver-silver chloride electrode in the same solution was used as the reference electrode, the theory of the E. M. F. of this combination being briefly indicated.

The silver-silver chloride electrode was prepared by making a suitable piece of 1 mm silver wire the anode, with a platinum wire cathode, in a 0.1 N sodium chloride solution at a current strength of about 2 ma for one hour. Mannitol was used in the usual way to render the boric acid titratable, and titration was effected with a sodium hydroxide solution (0.0231 N) of which 1 c c was equivalent to 0.25 mg of boron. It was found necessary to subtract from the gross titration the result of a blank determined by substituting distilled water for the sample solution. Satisfactory recoveries of known quantities of about 1.2 mg of boron are shown.

Improved direct Nesslerization micro-Kjeldahl method for nitrogen, E. S. West and A. L. Brandon (*Indus. and Engin. Chem., Analyt. Ed., 4 (1932), No. 3, pp. 314, 315*).—It was found that blood filtrates and urines were rapidly and completely digested by 1 to 1 sulfuric acid containing approximately 0.2 per cent of selenium; and the nitrogen values were similar to those found by a

peroxide method. The selenium did not interfere with Nesslerization. By using a digestion mixture of 1 to 1 sulfuric acid saturated with potassium sulfate and 0.2 per cent of selenium the rate of digestion was increased, and such a mixture was therefore considered preferable in the analysis of substances difficult to oxidize.

Elimination of corrections for nitrites in nitrate determinations, G. H. NELSON, M. LEVINE, and J. H. BUCHANAN (*Indus. and Engin. Chem., Analyt. Ed., 4 (1932), No. 1, pp. 56–58, fig. 1*).—In the evaporation of nitrites and nitrates to dryness, nitrites were decomposed at pH 3 and nitrates at pH 2 when acidified with acetic acid, in the trials reported in this contribution from the Iowa Engineering Experiment Station. Nitrites were destroyed by evaporation to dryness in the presence of ammonium chloride or ammonium sulfate from acid or moderately alkaline solution, but at pH 11 none of the nitrite was lost. Ammonium hydroxide and ammonium carbonate did not serve to decompose the nitrite on evaporation. The elimination of the troublesome correction for nitrites in the determination of nitrates by evaporation of a neutral solution in the presence of ammonium chloride or ammonium sulfate, and the possibility of utilizing a solution made acid (pH 3) with acetic acid for this purpose, is suggested.

Removal of bromide and iodide for detection of nitrate, M. J. MURRAY and A. W. AVENS (*Indus. and Engin. Chem., Analyt. Ed., 4 (1932), No. 1, p. 58*).—A note contributed from Cornell University calls attention to the undesirable dilution of solutions containing appreciable quantities of the halogens named which is effected by the use of water solutions (very dilute even when saturated) of either the sulfate or the acetate of silver. To eliminate this excessive dilution of solution 0.5 N with respect to silver sulfate was prepared by dissolving 7.8 g in 25 c c of 4 N ammonium hydroxide and diluting to 100 c c. The solutions tested for nitrate contained 250 mg of iodide, 100 mg of bromide, and 70 mg of chloride per cubic centimeter. The quantity of nitrate was varied from 0 to 1 mg per cubic centimeter. To 1 c c of each of these solutions, 3 c c of 6 N sulfuric acid and a slight excess of ammoniacal silver sulfate solution were added. Approximately 12 c c of the silver sulfate solution were necessary for complete precipitation of the halides. One c c of the filtrate was then mixed with 5 c c of concentrated sulfuric acid and the mixture cooled and overlaid with a little freshly prepared ferrous sulfate solution. At the end of 5 minutes, solutions containing 0.5 mg or more of nitrate per original cubic centimeter showed a definite brown ring at the junction of the two layers.

The solubilization of the soil constituents by the method of repeated extractions [trans. title], T. SAIDEL and G. PAVLOVSCHI (*Ann. Agron. [Paris], n. ser., 2 (1932), No. 4, pp. 459–503, figs. 5*).—An introduction takes up, following some brief general statements, the technic of repeated extractions, slow and accelerated sedimentation, and the interpretation of results. The remainder of the paper develops a mathematical analysis of the relations involved in the solution and extraction of soil components and of the expressions elaborated by various investigators to indicate the course and limit of such extraction.

The colorimetric determination of phosphoric acid in soils (*Imp. Bur. Soil Sci. [Harpenden], Tech. Commun. 9 (1930), p. [1]+8*).—The Denigès method (E. S. R., 44, p. 611) for the colorimetric determination of phosphates in soil extracts is discussed in some detail, together with a series of amplifications and modifications of the first-named procedure, including those of Fiske and Subbarow (E. S. R., 55, p. 310) and of Truog (E. S. R., 64, p. 312). Mention is also made of a method attributed to A. Gregoire involving a molybdate quinine solution as reagent and indicating the quantity of phosphate

present by the nephelometric density of a "fine, whitish, crystalline precipitate producing an opalescence measurable in the colorimeter."

Determination of phosphates in waters, J. E. FARBER and G. E. YOUNGBURG (*Indus. and Engin. Chem., Analyt. Ed., 4 (1932), No. 1, pp. 107–109, fig. 1*).—Truog's modification (E. S. R., 64, p. 312) of the Denigès ceruleomolybdate reaction (E. S. R., 44, p. 611) was further modified in an adaptation for the determination of small quantities of phosphates in waters. "This method . . . involves no deteriorating reagents except the dilute stannous chloride solution; the preparation of it, however, is extremely simple. The color development is immediate, the fading is slow . . . , and the amount of color obtained is greater than has been found for any other phosphorus method."

Investigations on the determination of phosphoric acid in artificial fertilizer materials [trans. title], G. H. C. VAN BERS (*Dept. Binnenland. Zaken en Landb. [Netherlands], Verslag. Landbouwk. Onderzoek., No. 37 F (1931), pp. 15*).—After a study covering a wide variety of methods the author concluded that the two most satisfactory were the colorimetric procedures involving, respectively, the reduction of the phosphomolybdate with hydroquinone and sodium sulfite, and the use of a solution of the chemically pure blue molybdenum compound in sulfuric acid, the reducing power of this solution for normal potassium permanganate having been determined.

Ashing plant materials to determine total phosphorus, B. W. HOWK and E. E. DETURK (*Indus. and Engin. Chem., Analyt. Ed., 4 (1932), No. 1, pp. 111, 112*).—Noting the tedious and time-consuming character of the standard magnesium nitrate method, the authors of this contribution from the University of Illinois present a procedure which consists essentially in mixing the weighed sample with an excess of pure calcium carbonate and igniting until the whole is perfectly white. This method was found very rapid, requiring but 20 to 30 minutes for large samples, and was applicable to widely varying types of plant material. Danger of spattering and the production of disagreeable fumes were eliminated, and the residue was rapidly and easily decomposed and brought into solution with dilute nitric acid. In the process of ignition the silica was completely dehydrated and could be filtered out. "As many as 40 or 50 total phosphorus determinations may be carried out on plant materials in a day using this method of ashing."

The determination of the nitrate nitrogen in fertilizer materials by means of copper-zinc powder [trans. title], T. ARND (*Angew. Chem., 45 (1932), No. 48, p. 745*).—The following description of materials and procedure is given:

Reagents.—Dissolve 200 g of magnesium chloride hexahydrate in about 750 c c of water, add 2 g of magnesium oxide, evaporate to about 250 c c, cool, filter, and make up to a volume of 500 c c.

Dissolve 2.5 g of cupric chloride dihydrate in 200 c c of water and shake the solution vigorously while adding 100 g of zinc dust, filter off the copper-zinc mixture at once by suction, washing quickly with a little water and then with alcohol, draw off the alcohol as fully as possible, and spread the copper-zinc in a thin layer till dry. To avoid heating of the copper-zinc dust, these operations must be carried out rapidly.

Determination.—Dissolve a sample of 0.25 or 0.5 g (of high or of relatively low nitrate content, respectively) to a volume of from 250 to 300 c c; add 25 c c of the magnesium chloride solution, 10 g of the copper-zinc powder, and 1 g of magnesium oxide; and distill until the residue amounts to but from 10 to 20 c c. Determine the ammonia in the distillate in the usual way.

A micro-method for nitrogen in plant material, L. D. DONEEN (*Plant Physiol., 7 (1932), No. 4, pp. 717–720*).—Place a sample of the plant material

(juice or dry substance) containing about 1 mg of nitrogen, in a large test tube (2.5 by 20 cm) and, if juice, evaporate to dryness. Add 1 c c sulfuric acid (nitrogen free) containing 1 g of salicylic acid to 20 c c of sulfuric acid. Mix thoroughly and allow to stand at least 20 minutes. "If large quantities of organic material are necessary to obtain sufficient quantities of nitrogen for Nesslerization, 2 c c of the sulfuric-salicylic acid mixture may be required."

Transfer the digested mixture to a 100-c c volumetric flask by washing the test tube with distilled water and dilute to approximately 50 c c. Add 5 c c of a 5 per cent gum arabic solution and neutralize with 10 per cent sodium hydroxide. "Ordinarily the gum arabic may be used without special preparation, but if color is obtained upon treating it with Nessler's solution or if reduction to free mercury occurs upon standing for some time, it is necessary to treat the gum arabic as directed by Chiles [E. S. R., 58, p. 804]."

The results of a series of determinations on identical samples by the proposed micro method and the Kjeldahl-Gunning method modified to include nitrate nitrogen are given.

Comparison of existing methods for the determination of ammonia nitrogen and their adaptability to plant juice, F. S. SCHLENKER (*Plant Physiol., 7 (1932), No. 4, pp. 685–695, fig. 1*).—This is a contribution from the Rhode Island Experiment Station recording the results of a comparison of five methods for the determination of ammonia. A modified form, presented in working detail, of the Folin and Bell permutit adsorption procedure (E. S. R., 37, p. 311) appeared best suited for application to plant material. The new procedure, which combines aeration with the use of permutit, "gives reliable results, and overcomes the difficulties of adsorbed pigments and hydrolyzable substances." Other methods given trial were the Van Slyke (E. S. R., 26, p. 22), the procedure used in the analysis of tobacco by Vickery and Pucher (E. S. R., 66, p. 805), and an aspiration method. All methods examined "recovered known amounts of added ammonia quantitatively."

The chemical treatments of wheat, flour, and bread, M. MOGOS (*Les Traitements Chimiques du Blé, de la Farine, et du Pain. Paris: Vigot Bros., 1931, pp. 140, fig. 1*).—The objective of the work here detailed was to determine under what conditions the examination of flours and the products made from them may reveal the practices of milling chemistry to which the materials have been subjected.

Following a brief introduction dealing with the histology of the wheat kernel in its relation to milling products, part 1 deals with the normal chemical treatment of wheat and chemical contaminations. Part 2, the chemical treatment of flours, contains a historical chapter, a classification and description of the methods, modifications of the properties of flour by chemical treatments, and, a critique on the methods of chemical treatment of flours, primarily from the viewpoint of hygiene. Part 3, taking up general methods of detection and investigation, covers in 9 chapters the detection of treatment with nitrogen peroxide, with chlorine, with potassium bromate, with ammonium persulfate, with sodium perborate, with benzoyl peroxide, with copper sulfate, with alum, and with stannous chloride. Part 4 deals in two chapters with the determination of boron and of bromine. Part 5 presents observations on the baking tests required in the course of the investigation. A summary of the work and its conclusions and a bibliography conclude the monograph.

Determination of reducing sugars in food products, C. F. POE and F. G. EDSON (*Indus. and Engin. Chem., Analyt. Ed., 4 (1932), No. 3, pp. 300–302*).—The authors propose the colorimetric determination of the sugars by taking advantage of their reduction of sodium 2,4-dinitrophenolate in alkaline solution

to form deeply colored products, as previously observed (E. S. R., 66, p. 802). Two reagents are suggested, the first to be used when small amounts (1 to 10 per cent) of reducing sugars are present, and the second for larger amounts: (1) Sodium 2,4-dinitrophenolate 8 g, sodium hydroxide 5 per cent 200 c c, phenol 2.5 g, Rochelle salt 100 g, and distilled water to make 1,000 c c; (2) sodium 2,4-dinitrophenolate 8 g, sodium hydroxide 5 per cent 200 c c, Rochelle salt 100 g, and distilled water to make 1,000 c c. Full manipulative detail is given.

Improved Soxhlet extraction apparatus, D. S. BINNINGTON (*Indus. and Engin. Chem., Analyt. Ed., 4 (1932), No. 1, pp. 125, 126, figs. 2*).—"The body of the extractor is extended considerably above the vapor inlet, and condensation is effected by means of a separate condenser [of a slightly modified Hopkins type] inserted into this upper portion, and . . . held in place by a wide flange on the top." The entire apparatus is constructed of a strong, heat-resistant glass, "which, together with the absence of fragile ground joints, makes a very rugged and serviceable outfit, well adapted to routine work."

Rapid centrifugal method for pectic acid determination, C. R. FELLERS and C. C. RICE (*Indus. and Engin. Chem., Analyt. Ed., 4 (1932), No. 3, pp. 268–271, figs. 2*).—In a procedure described in a contribution from the Massachusetts State College the filtered sample is hydrolyzed by alkali in a 15-ml tapered, graduated centrifuge tube under controlled conditions, and the resulting pectic acid gel is precipitated by hydrochloric acid, flocculated in a water bath, cooled, and centrifuged. The volume of precipitate is correlated with results obtained by the usual long gravimetric method. The method was found particularly adapted to the routine examination of a large number of samples of pectin solutions of similar composition.

Potentiometric titration of acidity in oils, R. R. RALSTON, C. H. FELLOWS, and K. S. WYATT (*Indus. and Engin. Chem., Analyt. Ed., 4 (1932), No. 1, pp. 109, 110, figs. 3*).—The platinum-carbon electrode couple is shown to possess distinct advantages over others previously suggested for the acidimetric titration of oils. An explanation of the second inflection point in the differential plot of results on oil titrations is made on the assumption of the presence of two different classes of organic acids. The system described was found to permit acidity determinations on oil samples as small as 0.5 g.

Potentiometric determination of acid number of linseed oil and its free fatty acids, B. P. CALDWELL and J. MATTIELLO (*Indus. and Engin. Chem., Analyt Ed., 4 (1932), No. 1, pp. 52–56, figs. 4*).—The work reported included potentiometric determination of the titration end points of stearic, oleic, and linolenic acids, and of the mixed free fatty acids of linseed oils, 95 per cent ethyl alcohol, amyl alcohol, butyl alcohol, and an equal-volume mixture of benzene and ethyl alcohol having been given trial as solvents. The benzene-alcohol mixture was found the most satisfactory.

The greater dependability of the quinhydrone electrode as compared with the hydrogen electrode was shown, and comparison of end points and acid numbers thus determined was made with those obtained by the use of phenolphthalein. While dissociation constants for the acids in these nonaqueous solvents have not been obtained, the results arranged the acids in the following order of decreasing strength: Stearic, oleic, mixed linseed fatty acids, and linolenic.

Determination of hydroxyl number of oils, fats, and waxes, W. L. ROBERTS and H. A. SCHUETTE (*Indus. and Engin. Chem., Analyt. Ed., 4 (1932), No. 3, pp. 257–259*).—The authors of this contribution from the University of Wisconsin find that the hydroxyl number, defined as the number of milligrams of potassium hydroxide equivalent to the hydroxyl content of 1 g of fat, oil, or wax, may be determined with economies of sample, reagents, and time if the reaction be

carried out in a sealed tube in the presence of acetic anhydride. Upon completion of the acetylation, the excess of acetic anhydride is hydrolyzed and determined as acetic acid by titration with 0.5 N potassium hydroxide solution.

"In contradistinction to the current procedure for determining the acetyl number, the entire process is carried out in the presence of the acetylated product except in the case of such samples as contain free soluble acids, when filtration prior to titration is necessary."

Detetrmination of oil content of pecans, R. D. LEWIS (*Indus. and Engin. Chem., Analyt. Ed., 4 (1932), No. 3, pp. 296, 297*).—A 4-g sample of the finely ground meats was treated, according to the author of this contribution from the U. S. D. A. Bureau of Chemistry and Soils, in a cream-test bottle with 35 c c of 1:1.5 sulfuric acid, the mixture being heated 15 minutes at 65° C. in a water bath, centrifuged, the mixture diluted with more of the acid and again centrifuged, and the bottle again placed in the water bath at 55°. The fat was read off in terms of butterfat and calculated to pecan oil by means of a suitable factor which was experimentally determined for oils from several varieties.

Ashing apparatus for samples containing traces of iodine, G. M. KARNS (*Indus. and Engin. Chem., Analyt. Ed., 4 (1932), No. 3, pp. 299, 300, fig. 1*).—The apparatus described in this paper has been designed to permit ashing samples slowly. "During such slow ashing the oxygen utilization is quite efficient, making it unnecessary to handle a large excess of oxygen and therefore enabling the use of a comparatively simple collecting train. The apparatus is also capable of giving a good ash without the aid of outside heat, and during its operation no destructible part of it becomes so excessively heated as to cause damage."

A new jelly-strength tester, C. R. FELLERS and J. A. CLAGUE (*Indus. and Engin. Chem., Analyt. Ed., 4 (1932), No. 1, pp. 106, 107, figs. 2*).—The instrument described in this contribution from the Massachusetts State College consists essentially of a rod extending from and passing through a cylinder in which the rod is held in the fully extruded position by an extension spring, an index, which projects through a graduated slot in the cylinder, showing the pressure in grams exerted by a plunger at the end of the rod as it is forced back into the cylinder against the contractive tension of the spring. A recording index, not attached to that projecting through the slot from the rod, is moved along the scale by the index fixed to the rod, and thus remains until reset at the scale reading of the maximum pressure attained before the jelly surface breaks and permits the plunger to spring back to its original position. To avoid adding the effect of gravity to the force exerted by the spring, the tests are to be made with the instrument held in a horizontal position.

Cut surfaces of jellies gave readings in general more reliable than those taken on outer surfaces. The average percentage of deviation from the mean was found to range in a large number of determinations from 3.51 to 4.7. "Because of the small probable error, the mean of three determinations on the same sample may be considered reasonably reliable." From 8 to 10 measurements per minute were found possible.

AGRICULTURAL METEOROLOGY

Aspects of rainfall in the Western Cape Province, F. E. PLUMMER (*Univ. Pretoria, ser. 1, No. 22 (1932), pp. XI+80, figs. 40*).—As the preface states, this article attempts "to give a general survey of hyetal conditions in relation to surface features in the western half of the Union of South Africa." It deals specifically with the incidence, variability, and regime of the rainfall in this province as a basis for geographical and agricultural study, and is

preliminary to a more comprehensive summary of the rainfall of the South African Union in relation to farming. Wide variations in amount and distribution of rainfall are noted. It is stated that even casual examination of the data "brings to the mind some indications of periodicity," but that "so far no attempt has been made to test the nature of this periodicity." The data "do not support the contention sometimes put forward that South Africa is drying up." The belief that "owing to its fluctuating character the rainfall of the Western Cape Province is considered to be of less value for crop production than the precipitation in European countries" is considered in some detail without definite conclusion.

Recovery of water from the aqueous vapor of the air [trans. title], L. CHAPTAL (*Ann. Agron. [Paris], n. ser., 2 (1932), No. 4, pp. 540–555, figs. 3*).—This article describes and gives results obtained with a ventilated cement and stone chamber designed for the condensation and collection of water from the aqueous vapor of the air, in an effort to determine whether significant amounts of water can be so collected. It was found that under certain conditions small quantities of water were collected in this way. Conditions favoring the operation are discussed.

A list of 26 references to literature relating to the subject is given.

[Measurements of solar radiation], C. G. ABBOT, L. B. ALDRICH, and F. E. FOWLE (*Ann. Astrophys. Observ. Smithsn. Inst., 5 (1932), pp. IX+295, pls. 11, figs. 33; rev. in Nature [London], 130 (1932), No. 3283, pp. 497, 498*).—A detailed account is given of development of methods, instruments, and work of the Astrophysical Observatory of the Smithsonian Institution on solar radiation and its relation to weather changes from 1920 to 1930.

Fifty years of weather in the Inland Empire, O. W. FREEMAN (*Northwest Sci., 6 (1932), No. 2, pp. 67, 68*).—Some of the major features and determining factors of the climate of the northwestern United States intermediate between that of the rainy coast region and the semiarid continental conditions of the interior, as disclosed by the oldest weather records available for the region, are briefly reviewed in this article, and their relation to agriculture is indicated.

Phenological observations, 1886–1907 [trans. title], W. A. POGGENPOHL (*Acta Phaenol., 1 (1931), Nos. 2, pp. 51–56; 3, pp. 73–90; Fr., Eng. abs., p. 90*).—From 22 years' phenological observations at Uman, Government of Kiev, Russia, calendars have been worked out showing the time of appearance of different stages of development of various wild and cultivated plants as related to the regional weather and climatic conditions.

Natural guides to the beginning, length, and progress of the seasons, A. D. HOPKINS and M. A. MURRAY (*Acta Phaenol., 2 (1932), No. 2, pp. 33–43; Ger., Fr. abs., pp. 41–43*).—This article reports and interprets results of observations at Kanawha Farms, near Parkersburg, W. Va., with a few native and cultivated plants selected as the more reliable indexes to the beginning of phenological spring, summer, autumn, and winter in that locality. It is stated that the seasonal events of one or more of the species used in these studies "will serve as reliable guides to the beginning, length, and progress of the phenological seasons for any other position of a given latitude, longitude, and altitude within their distribution on the western and eastern continents of the Northern Hemisphere."

The index plants and seasonal events used in these observations were: Beginning of spring, *Populus alba* (first flowers and flowers full), *Crataegus oxyacantha* (leaf buds swelling), *P. carolinensis* or *P. eugenei* (flower buds swelling), *Syringa vulgaris* (leaves unfolding), and *Forsythia suspensa fortunei*

(first flowers); beginning of summer, *Rosa* sp. (first flowers), and *Quercus alba, Q. velutina, Hicoria alba, H. ovata, Platanus occidentalis, Nyssa sylvatica, Sassafras variifolium,* and *Cercis canadensis* (full foliage); beginning of autumn, *Prunus serotina, N. sylvatica, Cornus florida, H. alba, H. ovata, S. variifolium,* and *Liriodendron tulipifera* (first normal color); and beginning of winter, *Q. coccinea, Q. alba, Q. imbricaria, Q. palustris,* and *Q. rubra* (maximum color), and *Q. velutina, S. variifolium, L. tulipifera,* and *Platanus occidentalis* (all leaves fallen).

A statistical study of the influence of weather on the growth and content of sugar beets in the Netherlands, H. J. Frankena (*Een Statistisch Onderzoek naar den Invloed van het Weer op de Opbrengst en het Gehalte van Suikerbieten in Nederland. Proefschr., Landb. Hoogesch., Wageningen, 1932, pp. [8]+173, figs. 2; Eng. abs., pp. 139, 140*).—From a detailed study of the relation of temperature, hours of sunshine, and rainfall, 1899–1926, to the yield, sugar content, and sugar production in the sugar beet growing regions of the Netherlands, and a critical review of the literature of the subject, an attempt is made to define the ideal climate for sugar beets and to deduce a formula for use in estimating in advance the probable production for any year.

The author concludes that the "climate in Holland, with regard to the production of sugar, is often too wet in the first part of the season, too cold and deficient in sunshine during summer, and too wet and dull toward the end." He finds that the period of planting and germination (April 20 to May 20) should be dry and the period from September 20 to October 20 should have little rain and much sunshine, the percentage of sugar depending largely upon these factors.

A regression equation which is stated to approximate the relation between atmospheric conditions and beet yield is given as follows: "$X_1=M+761x_2-75x_3$, X_1 being the amount of beet yield produced, M the average yield, x_2 the departure of the temperature during the last 20 days of July as compared with the average, x_3 the rainfall during April 20–May 20, as compared with the average. The above equation appears to hold within 6 per cent, and may prove useful so far as it enables to make an estimation of the production for the current year as early as August 1."

Individual influence on the flowering time of the varieties of fruit trees [trans. title], J. Hiemeleers (*Acta Phaenol., 1 (1931), No. 2, pp. 62–64; Eng., Ger. abs., pp. 63, 64*).—The author points out that to make observations on time of blooming of fruit trees strictly comparable, trees having the same origin as to the variety as well as to the stock should be used, since individual differences may result to a considerable extent from certain clonal variations and from the influence of the stock.

The dropping of the little fruits after blooming [trans. title], H. Bos (*Acta Phaenol., 1 (1931), No. 2, pp. 59–61; Fr., Eng. abs., p. 61*).—The author concludes that the dropping of young fruits, generally attributed to unfavorable weather during the blooming period, is in many cases due to a purely physiological cause, namely, the failure of the young leaf twigs to properly nourish the young fruits.

Phenology in the culture of vineyards [trans. title], A. Ziegler (*Acta Phaenol., 1 (1932), No. 5, pp. 133–145, figs. 4; Fr., Eng. abs., p. 144*).—Attention is called to observations on time of shooting, flowering, and ripening recorded for certain vineyards of Germany for many years past, but it is suggested that such observations, while probably of considerable practical value, should be used with caution in phenological studies.

SOILS—FERTILIZERS

[Soil and fertilizer work of the Arkansas Station] (*Arkansas Sta. Bul. 280 (1932), pp. 21–24*).—Notes by R. P. Bartholomew and G. Janssen are given on the effect of calcium in the nutrient media on the uptake of potassium by plants, the effect of fertilization with potassium on the exchangeable bases in soils, and the availability of ammoniated superphosphates; and by L. C. Kapp on absorption and utilization of nitrogen by rice, the effect of fertilizer on rice yields, the nitrogen content of submerged soils, and base exchange in rice soil.

[Soil investigations of the Illinois Station] (*Illinois Sta. Rpt. 1932, pp. 11–13, 15–38, 39, 40, 43, 44, figs. 14*).—Results are reported of studies by E. E. DeTurk, R. H. Bray, L. K. Eby, F. C. Bauer, K. B. Daniloff, A. W. Klemme, E. B. Earley, O. H. Sears, and L. E. Allison, including chemical analyses of soils left in grass and cropped continuously to corn and data as to reduced corn shrinkage of the crop is grown on the better soils, retardation by legumes of the need for extensive soil treatment, effect of soil treatment on systems of farming, manurial value of straw piles and other residues and farm manure, variation among clovers in limestone and phosphate requirements, cumulative benefits from limestone, the choice of phosphate carriers as related to soil type, advantages of finely ground phosphate, response of corn to potassium on old sweetclover land, fertilizer deficiencies on various soil types, value of common white sweetclover in soil improvement, need of potassium by sweetclover, and inoculated soybeans v. red clover as a soil builder.

[Soil and fertilizer studies in Oklahoma] (*Oklahoma Sta. [Bien.] Rpt. 1931–32, pp. 14–16, 25, 59, 60*).—Results are briefly summarized of studies on the solubility of the phosphorus in Oklahoma soils, by H. J. Harper, including a method for its determination; losses of organic matter from Oklahoma soils, by H. F. Murphy; and nitrogen conservation in heavy plains soils, by H. H. Finnell.

The American method of soil classification and survey, L. L. Lee (*Imp. Bur. Soil Sci. [Harpenden], Tech. Commun. 6 (1930), pp. [2]+19*).—This contribution from the New Jersey Experiment Stations contains a historical note, a general statement of the American method of soil classification and sections on the present American soil survey organization, the recognition of soil types in the field, the scale of mapping, field procedure, the examination of soil types in the field, the correlation of soil types, and the application of the American system to other parts of the world; together with appendixes on (1) the determining characteristics of the soil series; (2) the determining characteristics of the soil classes; (3) the field record; and (4) an outline of a soil survey report. A reference list of 25 papers is added.

Methods of taking soil profiles (*Imp. Bur. Soil Sci. [Harpenden], Tech. Commun. 7 (1930), pp. [1]+8*).—Summarized working directions for the preparation of (1) whole monoliths, (2) profile sections taken in situ, and (3) an artificial section made up in the laboratory are here brought together from various sources, with some notes and modifications. For the whole monolith two slightly different procedures are given.

Soil survey of Polk County, Florida, E. D. Fowler et al. (*U. S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpt.], Ser. 1927, No. 39, pp. 39, pls. 8, fig. 1, maps 2*).—Polk County consists of 1,192,320 acres made up of a comparatively high rolling lake region, ill-drained flatwoods, and ill-drained stream valleys in the center of the Florida peninsula.

Of 12 series and 15 types, Leon fine sand, highly acid and ill drained, is the only classified type of large extent listed, this soil constituting 27 per cent of

the county. Unclassified material, including 9.6 per cent of peaty muck, 4.8 per cent of water and grass, 2.3 per cent of cypress ponds, and 6.1 per cent of swamps, amounts to 24.2 per cent of the county.

Soils in relation to fruit growing in New York.—Part I, A detailed soil survey of the Hilton area, Monroe County, A. T. Sweet and J. Oskamp (*New York Cornell Sta. Bul. 541 (1932), pp. 16, fig. 1, map 1*).—Dividing the soils examined into the four groups, Lacustrine, Till, Depressional, and Alluvial, the present bulletin gives a survey report more detailed than that usually made and limited to the relatively small area of 14,442.2 acres, with a soil map scaled at about 5.3 in. to the mile instead of the more usual 1 in. to the mile. In addition to the groups named, series based on drainage conditions and a somewhat limited classification into texture types are noted.

On the basis of the classification scheme above noted there are listed in the Lacustrine group 11.03 per cent of a silt loam type, 12.5 per cent of a loam; in the Till group, 20.69 per cent of a type described as loam to fine sandy loam; in the Depressional group 13.91 per cent of a silt to clay loam. These, with less extensive types, make a total of 17 types in the four groups; and in the Depressional group are included small percentages of muck and marsh.

"It is felt that the soils defined and the boundaries outlined in the present survey come about as near to having important significance for fruit-growing purposes as it is practicable to make them" with the knowledge available.

The properties of sugar cane soils of Java, C. H. van Harreveld-Lako, trans. by R. L. Pendleton (*Groningen: P. Noordhoff & Co.; Manila: Sugar News Press, 1932, pp. [12]+112*).—The translator notes that "there is a very considerable similarity between the soils of the sugar districts of Java and those of the Philippines, both because of the similarities of climate and because to a considerable extent the soils of both regions are derived from relatively recent fragmental volcanic materials, i. e., ash." "Because of these similarities, and because at the present time there has been a very great deal more research carried out on the soils of Java than on those of the Philippines," the present translation has been prepared for the use of classes in soil fertility in the College of Agriculture, University of the Philippines.

The contents are as follows: The Island of Java, soil formation, components of the soil, colloids, texture of the soil, structure of the soil, humus, absorption and fixation of fertilizer materials in the soil, microbiology of the soil, the soil and the crop, the reaction (pH) of the soil, compact layers in the soil—padas, and soil research.

The origin and nature of the peaty soils of Travancore, T. R. N. Pillai and V. Subrahmanyan (*Jour. Indian Inst. Sci., 14A (1931), No. 7, pp. 99–117, figs. 2*).—The organic matter in the Kari soil appeared to be derived from kathira, an aquatic grass which was observed to flourish in the surface water of the soil, and to a small extent from the remains of a previous forest vegetation. As in other peat soils, lignins left over from the decaying vegetation were found to form the bulk of the organic matter of the Kari soil. "Nitrogen is present chiefly as humin. There is evidence to show that the soluble and the more readily decomposable plant constituents are converted into that resistant form in the soil.

"The high moisture contents of air-dried specimens of the soil have been shown to be due to the presence of resins, which form protective coats around the soil particles and prevent the movement of water and plant nutrients from within as well as from without."

The minerals found, particularly the iron and aluminum sulfates, did not appear to be related to the plant residues, the evidence obtained indicating,

rather, that large quantities of iron and aluminum compounds are washed down into the Kari lands from the higher regions during the monsoon months, and that these "are dissolved and further reacted upon in presence of organic acids formed by decomposition of plant materials and the sea salts brought in during the tidal rises." The mechanism of the biological and chemical reactions leading to the formation of the more important mineral constituents, particularly the characteristic ferrous aluminum sulfate ($FeSO_4Al_2(SO_4)_3 24H_2O$), is discussed. The possibility of utilizing the free sulfuric acid released from the Kari soil for rendering insoluble phosphates available for plant nutrition is indicated.

Contributions to the knowledge of the soils of Asia, I, B. B. Polynov et al. (*Leningrad: Acad. Sci. U. S. S. R., Dokuchaiev Inst. Soil Sci., 1930, pt. 1, pp. 44, pls. 3, fig. 1*).—This pamphlet contains an introduction and a report on the work of the subcommission for the compilation of the soil map of Asia, by Polynov; and papers on the soils of Japan and the soils of Manchuria, by O. N. Mikhailovskaia and by V. A. Baltz and Polynov, respectively.

The report on the work of the subcommission notes the nature of the information at hand and the progress made on the soils of Japan, China, Mongolia, Indo-China, the Philippine Islands, the Malay Archipelago, India, Palestine, Arabia, Asia Minor, Persia, and Afghanistan. The reports on the soils of Japan and of Manchuria describe in some detail the major soil areas of the countries named, taking up the conditions of soil formation, climatic influences, vegetation, and other factors.

The laws of soil colloidal behavior.—IX, Amphoteric reactions and isoelectric weathering, S. Mattson (*Soil Sci., 34 (1932), No. 3, pp. 209–240, figs. 5*).—This serial contribution from the New Jersey Experiment Stations (E. S. R., 67, p. 219) is here continued with a general, theoretical discussion of the nature of compounds (derived or conjugated ampholytoids comprising combinations containing residual hydrogen and hydroxyl ions and formed from weak polyvalent acids and bases) concerned in weathering reactions in soils; neutralization; the effects of limited dissociation of colloidal salts; hydrolysis; application to insoluble compounds; maximum stability; the ultimate pH value; exchange acidity and alkalinity; acidic and basic hydrolysis; isoelectric weathering; climate, pH value, and composition; the comparative behavior of aluminum and iron; the silica-sesquioxide ratio; and the ratio $\frac{SiO_2}{MO+M_2O}$ in colloids and in river water; together with experimental data bearing upon a number of these phases of the general question.

The observations and conclusions recorded are in part indicated in the statements that "it is in general true that amphoteric compounds are least dispersible, least soluble, and least ionized, and are therefore most stable at their isoelectric point. Therefore, under conditions of heavy leaching, the tendency would be for the formation of an isoelectric soil complex. A study of the prevailing pH in different latitudes of humid regions, of the composition of soil colloids and of river water supports this theory of isoelectric weathering."

Soil moisture problems and the farming in south Manchuria [trans. title], K. Tsukunaga (*Res. Bul. Agr. Expt. Sta. So. Manchuria Ry. Co., No. 7 (1932), pp. 1–41, pls. 12; Eng. abs., pp. 37–41*).—The author found that the distribution of soil moisture in nine profiles of south Manchurian soil in seven layers, each 17 cm in depth, varied with the kind of soils and with geological features. According to the results of his studies, Manchurian soils contain from 13 to 20 per cent of moisture, mean value, to a depth of from 0 to 117 cm. The upper horizons of nine profiles (0 to 33 cm in depth) contained from 11 to 20 per cent of moisture, corresponding to from 41 to 53 per cent of the water-

holding capacity of the soils but for the most part amounting to less than 53 per cent. Lower horizons of the nine profiles (67 to 100 cm in depth) contained from 14 to 20 per cent of moisture, corresponding to from 42 to 60 per cent of the water-holding capacity but amounting generally to less than 55 per cent. The moisture content of the 17–50 cm horizon was usually highest, the moisture content of lower horizons decreasing with the depth. The horizon of from 0 to 50 cm contained about 20 per cent of moisture, in mean value, which corresponded to 53 per cent of the water-holding capacity, while the horizon of from 67 to 100 cm contained less than 53 per cent. From two years' results it was concluded that the moisture content of these soils rarely reaches 60 per cent of the water-holding capacity.

The movement of capillary moisture in the A_1 horizon was found very slow, that in the B horizon, A_2 horizon, and C horizon following in that order. In the rainy season of south Manchuria, the greater part of the rainfall appeared to be evaporated or to run off, but the water which percolated through the A_1 horizon appeared to permeate the A_2 horizon. In the dry season the rising moisture through the C and B horizons permeated the A_2 horizon rapidly, this moisture apparently being preserved in the A_2 horizon or in the under part of the A_1 horizon because of the very slow movement of capillary moisture in the A_1 horizon.

Crop yields were found to increase with increasing moisture content of the soil up to about 70 per cent of the water-holding capacity, dropping off again at about 78 per cent. The crops studied (soybeans and wheat) could not grow in a soil containing moisture amounting to more than 91 per cent of the water-holding capacity. The effectiveness of fertilizers was found also to be increased by increased moisture content up to 70 per cent of the water-holding capacity.

The behavior of the water content and cations of mineral soils, P. Vageler (*Der Kationen- und Wasserhaushalt des Mineralbodens. Berlin: Julius Springer, 1932, pp. [VII]+336, figs. 34*).—Following a brief foreword and an introduction further emphasizing the close interrelation of all the widely diversified phenomena of the soil, the remaining chapters include the following: A statement and examples of the problem; physical fundamentals; the soil substances having a sorption capacity and the nature of their complexes; the water supply and the water balance of the soil; the soil as a source and carrier of nutrients; and investigational and analytical methods. A bibliography, author index, and subject index are appended.

The degree of solubilization of the phosphorites and of leucites in the soil [trans. title], C. Antoniani and M. Niccolini (*Gior. Chim. Indus. ed Appl., 14 (1932), No. 10, pp. 490, 491*).—The authors of this contribution from the Royal Higher Institute of Agriculture of Milano made a study of the use, as a supplement to the Neubauer (E. S. R., 53, p. 319) method, of the solubilization of phosphorite and of leucite in contact with soils moistened to 30 per cent of saturation capacity and maintained at that moisture content.

In a neutral or feebly alkaline soil after 5 or 6 months, the quantity of phosphorite being from 0.02 to 0.001 of the weight of the soil, there were found to have been solubilized about 2 mg of phosphorus (as phosphoric anhydride) in 100 g of soil. In a slightly acid soil there was found to be solubilized under like conditions a quantity of phosphate about twice that rendered soluble in the alkaline soil.

In the case of the leucite solubilization was more rapid, reaching 5 mg of potassium (as the oxide) in every 100 g of the soil in 2 months' contact of the leucite with the soil and rising to about 10 mg after a contact of from 6

to 7 months. In the case of the leucite the nature of the soil had much less effect upon the final result.

The presence of mineral sulfides in an arable soil [trans. title], G. BERTRAND and L. SILBERSTEIN (*Ann. Agron.* [Paris], *n. ser., 2* (1932), *No. 4, pp. 454–458*).—A soil selected for experiments with sulfatic fertilizers, and on which plants made little or no growth, was shown to contain sulfides readily decomposable by dilute hydrochloric acid. Reducing actions brought about by bacteria of which the growth has been favored by the long unworked condition of the soil in question, with the concomitant compaction of the vegetational layer, are considered responsible for the presence of the sulfides and the infertility of the soil. Thorough aeration by a working of the surface soil to bring about the disappearance of the reducing organisms is considered a treatment necessary to the restoration of fertility in soils thus affected.

Determination of exchangeable bases and lime requirement (*Imp. Bur. Soil Sci.* [*Harpenden*], *Tech. Commun. 12* (*1930*), *pp.* [2]+37).—"While a description of a few standardized methods applicable to all soils would have been convenient, the modifications of existing methods and the new procedures required to suit particular soils have made this impracticable. Descriptions of the methods already established and in general use, followed by recent modifications, are therefore presented in some detail. In view of the recent application of electrodialysis to base exchange work, it has been considered advisable to include a description of the technic of electrodialytic methods in their application to soils." Part 1 contains methods applicable in the absence of soluble salts, methods applicable to soils containing soluble salts, application of electrodialysis, and a summary of methods; and part 2 presents methods for determining exchangeable hydrogen, saturation capacity, and lime requirement, together with a summary of methods, references, and a bibliography.

[Soil nitrate investigations], A. KEZER (*Colorado Sta. Rpt. 1932, pp. 10–12*).—Data are reported on soil nitrate control and the effect of organic material of various nitrogen contents on nitrate production.

The soil plaque Azotobacter test for soil deficiency: A try-out of the test on twenty-three samples of Ontario soils, May–August, 1931, D. H. JONES (*Sci. Agr., 12* (*1932*), *No. 12, pp. 716–726, fig. 1*).—The author of this contribution from the Ontario Agricultural College applied an adaptation of the Winogradsky Azotobacter test as developed by Sackett (E. S. R., 66, p. 616) to three groups of soils, the results confirming in each case the dependence of Azotobacter upon an adequate phosphate supply.

In the first group of soils, taken from unphosphate check plats in a number of experiment fields representing a diversity of soil types, the results indicated that every sample needed phosphate for Azotobacter colony development. The crop returns from the check plats from which the samples were taken, when compared with the crop returns from the fields treated with phosphate fertilizers, showed that marked benefits had accrued from the phosphate treatment.

The second group included acid clay soils variously treated with chemical fertilizers, including superphosphate, tricalcic phosphate, lime, sulfur, and complete fertilizer, twice during the preceding five years. "The Azotobacter soil plaque test indicated that notwithstanding that fertilizer had been applied previous to cropping, every sample required phosphate to enable Azotobacter colonies to develop, just as in the case of the samples of the first group. Chemical determinations showed that the available P content of these soils was no greater on the average than that of the soils in the first group. It would, therefore, appear that the phosphates added to these plats as fertilizer had been all utilized by the growing crops except in the case where tricalcic phosphate

was used, which, not being so readily soluble as the superphosphate, the crops had not so much benefited by it as in the case of the superphosphate, and more of it was left as a residue in the soil."

The third group consisted of two muck soils from a reclaimed swamp area One of these had been under cultivation for four years and had been heavily fertilized with phosphatic fertilizer. The Azotobacter soil plaque test from this sample showed a heavy Azotobacter colony development on the check plaque, as well as on the plaque to which phosphate was applied. The other sample, from an adjoining area that had only just been reclaimed, was under cultivation for the first time and no fertilizers had been applied. No Azotobacter colonies developed in the check plaque, but three Azotobacter colonies developed on the plaque to which phosphate had been added, "thus showing that even in the newly reclaimed swamp soil, a very few Azotobacter occurred but that owing to lack of phosphate they could not flourish."

In the case of the reclaimed, cultivated muck soil, it is noted, however, that "as the last crop of lettuce from this soil had been very poor, it was evident that some factor other than lack of phosphates was the cause of the trouble. Therefore in this case the plaque test was not satisfactory as an indicator of soil deficiency."

The presence and distribution of sulfofying bacteria in mineral and peat soils, J. K. Wilson and H. W. Higbee (*Jour. Amer. Soc. Agron., 24 (1932), No. 10, pp. 806–821*).—More than 200 soil samples, some freshly collected, others in an air-dry condition for 7 years, were examined by the authors at the New York Cornell Experiment Station for their numerical content of sulfofying bacteria. The samples represented both mineral and peat soils.

The largest number of sulfofying bacteria found in any sample was 10,000 per gram. In only four samples were the bacteria absent in a 2-g quantity. These had been in an air-dry condition for several years. Air-drying soils reduced the number of sulfofying bacteria but did not destroy all of them.

There was no evident relationship between the number of sulfofying bacteria and the reaction of the soil or between the number of such organisms and the content of calcium, magnesium, sulfur, nitrogen, or phosphorus or between the numbers present and the ratios of these elements one to another. It is indicated that an air-dry peat soil of a high calcium content may contain more sulfofying bacteria than does one of which the calcium content is lower.

Data from six soil types representing 20 samples taken both in the spring and in the fall from the same location showed in every case a larger number of sulfofying bacteria in those samples collected in the fall.

No one soil series was found markedly more efficient in supporting the sulfofying bacteria than was any other. Each soil series examined, inorganic or organic, had a native sulfofying flora which prevented the accumulation of elemental sulfur in the soil.

[Soil bacteria studies by the New York State Station] (*New York State Sta. Rpt. 1932, pp. 28, 29, 89, 90*).—Results are briefly noted of studies on the growth of bacteria in soils of low productivity and the effects of fertilizers on the growth of plants and bacteria in such soils.

Handbook of plant nutrition and fertilizer theory.—I, Plant nutrition. II, Fertilizer materials and their use, edited by F. Honcamp (*Handbuch der Pflanzenernährung und Düngerlehre. Band I, Pflanzenernährung. Band II, Düngemittel und Düngung. Berlin: Julius Springer, 1931, vols. 1, pp. XV+945, [pl. 1], figs. [89]; 2, pp. XII+919, figs. 285*).—The first of these two volumes contains historical notes on the development of plant nutrition, data on the constituents and composition of the plant body, the cycle of natural materials,

the physiology of the metabolism of plants, the soil as a medium and foodstuff reserve for the plant, the law of returns, solution culture and vegetation experiments, the field experiment, the evaluation of fertilizer experiments, and the determination of the nutrient needs of soils, as well as a subject index. The second discusses the materials and use of fertilizers, natural and artificial fertilizers, the application of artificial fertilizer materials, the use of fertilizers for agricultural crop plants, forestry, moor and meadow soils, and in ponds, and plant protection and the use of fertilizer materials, as well as a subject index.

Fertilizers and food production on arable and grass land, F. KEEBLE (*Oxford: Univ. Press, 1932, pp. [X]+196, figs. 8*).—"The aim of this book is to show that a large increase of home-grown food can be brought about—and brought about quickly—by means of fertilizers." In spite of the established place of the use of fertilizers in British agriculture, however, "the application of fertilizers, even to arable land, though it has increased in striking manner during the last decade has not grown so rapidly in this country as it has in many countries abroad; and so far as pasture land is concerned, the recognition that it also requires to be supplied continually with the essential plant foods which it lacks is of such recent origin that the right use of fertilizers on grassland has scarcely begun to be practiced." The author notes that although phosphatic fertilizers are widely applied to grasslands, nitrogenous fertilizers are not, "and, until they are, grazing lands universally hungry for both phosphates and nitrogen will continue to contribute far less than they should to the food supply of the nation."

Of the organization of the present discussion it may be noted that "part 1 describes the way in which fertilizers may be used to increase food production in the immediate future. Part 2 shows the means by which food production may be further increased in the more distant, but by no means remote future."

The effect of temperature and moisture content on the decomposition of plant residues by microorganisms [trans. title], S. A. WAKSMAN and F. C. GERRETSEN (*Dept. Binnenland. Zaken en Landb. [Netherlands], Verslag. Landbouwk. Onderzoek., No. 37 A (1931), pp. 63–99, [pl. 1], figs. [9]*).—The experiments here recorded were concerned with the decomposition of plant material in the form of oat straw, and of individual groups of chemical constituents present in such material, at various temperatures, with and without the addition of nutrient salts.

The accelerating effect of rise in temperature from 7 to 37° C. upon the decomposition of the compost as a whole was found to be greatest in the first 10° of the temperature range specified, and in the first three months of the decomposition period. In 105 days at 18°, 1.9 times as much decomposition took place as at 7°; at 37°, 2.3 times as much. In the following six months the decomposition rate was about the same at all temperatures. Of the original quantity, 9.4 per cent disappeared at 7°, 9.8 per cent at 37°.

The decomposition of the ether-soluble fraction was the most markedly affected by an increase in temperature, the decomposition in 48 days at 37° having been about 27 times that attained in the same time at 7°. As the decomposition progressed the cellulose and hemicellulose fraction decreased, while the lignin and protein content increased; an example being that of a compost of which the cellulose and hemicellulose fraction dropped from 54.4 to 6.6 per cent, the lignin at the same time increasing from 13 to 21 per cent, the protein content from 2.1 to 17.6 per cent. It appeared that not only protein but lignin compounds could be built up as well as broken down by the microorganisms present. The equilibrium between the building up and the breaking down both

of protein and of lignin complexes was carried toward the synthetic side by a lowering of the temperature.

The addition of nutrient salts, especially that of available nitrogen compounds, accelerated the humification, the decomposition of the cellulose-hemicellulose fraction being most increased, that of the lignin much less affected.

The carbon-nitrogen ratio went down sharply during decomposition, the higher the temperature the lower the figure. In the material first decomposed the ratio became, in about one year, the same as that of humus extracted from the soil.

Further studies on the value of various types of organic matter for improving the physical condition of soils for plant growth, H. B. Sprague and J. F. Marrero (*Soil Sci., 34 (1932), No. 3, pp. 197–208*).—Continuing previous work (E. S. R., 65, p. 813), the improvement of the physical properties of a clay loam soil, effected by incorporating various types of organic matter, was investigated at the New Jersey Experiment Stations in the greenhouse with pot cultures planted to grass and supplied with an abundance of moisture. From the standpoints (1) of the persistence in the soil of the several types of organic matter, the sustained improvement in available water-holding capacity of the soil and in its pore space, and the excellence of internal drainage resulting from the incorporation of organic substances, and (2) of the growth made by grass on treated and untreated soils, the conclusion was drawn that cultivated New Jersey peat was the most valuable substance included in the tests, and that raw Michigan peat was second in value, with imported peat moss, well-rotted manure, and spent mushroom soil following in the order named.

"These results were compared with a similar experiment conducted under a system of limited watering, in which the moderately fibrous materials, such as raw Michigan peat and rotted manure, proved superior. With more abundant watering, the rate of decomposition for the raw peat and manure increased, giving the advantage to the more resistant cultivated peat."

The drying of each type of organic material to an air-dry condition greatly reduced the capacity for absorption, and this power was recovered very slowly with successive additions of free water, the cultivated peat being less injured by air-drying than raw peat. Imported peat moss recovered a smaller percentage of its absorptive capacity than did any of the other types.

The cultivated peat raised the organic content of field soils over a period of two years more effectively than did any other material, well-rotted manure, peat moss manure, and spent mushroom soil following in the order given. The rate of decomposition of the organic substance of each of the materials was found to be correlated with the porportional content of slowly decomposable constituents such as lignin.

Comparative rate of decomposition of composted manure and spent mushroom soils, S. A. Waksman and M. C. Allen (*Soil Sci., 34 (1932), No. 3, pp. 189–195, fig. 1*).—Extending previous work (E. S. R., 66, p. 316) on the decompositions effected by *Agaricus campestris*, the authors of this contribution from the New Jersey Experiment Stations investigated the effect of the growth of this fungus on the chemical composition of fresh and composted horse manure, its influence in making the organic complexes in composts available to soil microorganisms, the decomposition of lowmoor peat by *A. campestris*, the influence of the growth of *A. campestris*, upon the availability of the organic complexes in lowmoor peat to soil microorganisms, and the effect of *A. campestris* upon the solubility of the humus in composted manure.

"The growth of the cultivated mushroom, *A. campestris*, upon composted manure results in rendering the organic complexes more readily decomposable by the microbial population of the soil." This fungus, in contrast to micro-

organisms active in soils and composts, attacks lignin materials in preference to celluloses and hemicelluloses.

Fixed nitrogen, edited by H. A. Curtis (*New York: Chem. Catalog Co., 1932, pp. 517, figs. 82*).—The scope of the book is indicated in the headings of its chapters, witten by a considerable group of specialists as follows:

General Survey of the Sources and Utilization of Fixed Nitrogen, by H. A. Curtis; Nitrogen Fixation by Living Organisms, by F. E. Allison; The Chilean Nitrate Industry, Fixed Nitrogen Recovered in Coal Carbonization, and a History of Nitrogen Fixation Processes, all by H. A. Curtis; Physical Methods of Studying Chemically Active States of Gases and of Investigating Catalyst Surfaces, by C. H. Kunsman; The Arc Method of Nitrogen Fixation, by N. W. Krase; Synthetic Ammonia, by P. H. Emmett; Some Physical Properties of Hydrogen, Nitrogen, Methane, Ammonia, Carbon Monoxide, and Carbon Dioxide, and Their Mixtures, by R. Wiebe; High Pressure Equipment and Technic, by J. R. Dilley and W. L. Edwards; The Cyanamide Method of Nitrogen Fixation, by H. J. Krase; The Alkali Cyanide Method of Nitrogen Fixation, by E. W. Guernsey; Synthesis of Urea and Oxidation of Ammonia, by H. J. Krase; Synthetic Nitrogenous Fertilizers, by W. H. Ross and A. R. Merz; and Nitrogen Statistics, by P. E. Howard.

In the prefatory summing up of the subject in hand the editor states that, "at the beginning of the present century there existed a 'nitrogen problem.' The agricultural and industrial demands for nitrogen compounds were increasing rapidly, and the natural sources of supply were limited. Today, the nitrogen problem, if there be one, is to find a market for the output of fixed nitrogen potentially available."

Overliming acid soils, A. R. Midgley (*Jour. Amer. Soc. Agron., 24 (1932), No. 10, pp. 822–836, figs. 3*).—In laboratory and greenhouse experiments at the Vermont Experiment Station crop growth was found often to be injured when fine, high-calcic limestone was applied to very acid soils in excess of their lime requirement. This condition may also result when the calculated amount of lime is not worked into the proper soil depth, the limed area in this case receiving several times its lime requirement for some time.

The plants found to be most susceptible to injury on overlimed acid soils were flax, rape, mustard, alfalfa, and most of the clovers. The first symptom of injury was a brown, stubby, and somewhat knotty root growth. "In severe cases, with flax, the epicotyl does not emerge beyond the cotyledons, but the latter enlarges for some time, then finally the whole plant dies."

Overliming injury could be produced only on heavily limed acid soils. Neutral or basic soils similarly limed never exhibited the injury. High pH values due to excessive lime additions did not seem to be the major cause of the trouble. Liberal applications of nutrients reduced the injury very little, if any. Considerable quantities of soluble calcium in the form of bicarbonate were found in heavily limed acid soils; but the injury could not be produced artificially with soluble calcium salts or bicarbonates.

Nitrite nitrogen increased with increasing quantities of lime, "yet it is very doubtful if it accumulated sufficiently to be injurious." Overlimed soils graually lost their injurious effects with age. The injury was completely overcome on some soils by the time the first crop was removed, but with others two or three croppings were necessary before it was completely overcome.

No injury could be produced with calcium silicate, even though it proved to be as effective as calcium carbonate in reducing soil acidity; indeed, calcium silicate was shown to be very beneficial in reducing the injury produced by overliming with calcium carbonate. Large additions of organic matter, such as straw, alfalfa meal, and manure, were also found very effective in reducing

overliming injury. "From a practical standpoint this finding is important because it indicates that a liberal addition of green or stable manure should be applied to the soil if immediate liming and seeding are necessary."

Commercial fertilizers report for 1932, E. M. Bailey (*Connecticut State Sta. Bul. 343 (1932), pp. 64+X*).—In addition to the usual analytical data, the bulletin concisely summarizes some recent changes affecting fertilizer control. Official definitions of fertilizer materials and interpretations of terms are also given.

Analyses of commercial fertilizers, fertilizer supplies, and home mixtures for 1932, C. S. Cathcart (*New Jersey Stas. Bul. 549 (1932), pp. 31*).—The bulletin presents analyses for most of the fertilizer materials sold in 1932.

Digest and copy of the fertilizer law, C. S. Cathcart (*New Jersey Stas. Circ. 260 (1932), pp. 8*).—This is a revision of Circular 9 (E. S. R., 28, p. 326), adding amendments to the law enacted in 1919, 1931, and 1932.

AGRICULTURAL BOTANY

The root as an absorbing organ, I, II (*New Phytol., 27 (1928), No. 3, pp. 125–140, pl. 1; 141–174, pl. 1, figs. 20*).—This is in effect a reexamination of some views regarding water and solute movements in relation to plants.

I. *A reconsideration of the entry of water and salts in the absorbing region,* L. I. Scott and J. H. Priestley.—This paper presents chiefly, in the light of recent studies, a reconsideration of the entry of water and of solutes in the absorbing region of the root. The assumption that the passage of water and of solutes between soil and root takes place almost entirely by way of the root hairs is claimed to be most insecurely based.

The absorbing region of the root is the part between the apical meristem and the regions having completely suberized membranes. In this region the root cortex may be regarded as a sponge work of cellulose walls containing the protoplasts in its meshes, this sponge work being interrupted at the endodermis by the Casparian strips. The superficial cells extend to form root hairs, when their external walls pass through the amyloid stage.

The entry of water and that of salts are said to be quite independent. It is suggested that the cortical and the endodermal cells accumulate ions from the soil solution, and that these are liberated from the endodermal cells on the inner side owing to the greater acidity of the stelar sap.

When water is excessive the soil solution permeates the cellulose walls of the cortex, the cortical and endodermal cells absorbing water until they are turgid. The protoplasts of the endodermal cells serve as a semipermeable membrane across which water is drawn from the outer tangential walls by the osmotic tension of the stelar solution in the inner tangential walls. Under these conditions the surface area of the root is unimportant. In drier soils water is less free to move, and importance attaches to the increase in root surface caused by growth and the production of root hairs. In comparatively dry soils root hairs perform an important function in connection with water absorption.

II. *The delimitation of the absorbing zone,* L. I. Scott.—An account is given regarding different types of root system as examined to determine how and how much the absorbing zone is delimited in older parts. Absorption as occurring under different moisture conditions is discussed in relation to the types of endodermis and exodermis and in relation to seasonal variation in the extent of absorbing zone.

Plasmolysis [trans. title], B. H. el Derry (*Protoplasma, 8 (1929), No. 1, pp. 1–49, figs. 3*).—This is a study of form and time elements in plasmolysis.

The carbon-nitrogen ratio in the wheat plant, P. A. Hicks (*New Phytol., 27 (1928), No. 1, pp. 1–46, pl. 1, figs. 13*).—In a study of the carbon-nitrogen relations ascertainable during the development and senescence of three strains of wheat differing as to length of growth period, the total elemental carbon and total elemental nitrogen were estimated by microanalytical methods. It is stated that all strains if grown under exactly similar conditions tend to produce embryos having similar carbon-nitrogen ratios, irrespective of the actually contained carbon and nitrogen as well as of the length of a growing period. Under ideal conditions embryos hold true to maternal type as to carbon and nitrogen content. Their composition is affected by nitrogen shortage. Early germination stages show a low carbon-nitrogen ratio, which is kept constant even though there is a rapid percentage loss of carbon and nitrogen. High carbon and high nitrogen content contribute to winter hardiness and compensate for a longer period of germination. A low carbon, medium nitrogen, and low carbon-nitrogen ratio favors vegetative growth. Vegetative activity steadily reduces the nitrogen percentage, but carbon rises to a maximum about halfway through the life history. Carbon percentage falls considerably before blooming. The carbon-nitrogen ratio rises steadily throughout the vegetative growth, and when a sufficiently high ratio is present flowering occurs. For each cultural strain flowers are initiated at a different carbon-nitrogen ratio value, but in every case at a maximum of the ascending carbon-nitrogen ratio curve.

"The younger the tissues the lower the carbon-nitrogen ratio."

The formation of formic aldehyde in living plants during chlorophyll synthesis [trans. title], G. Pollacci and M. Bergamaschi (*Atti Ist. Bot. R. Univ. Pavia, 4. ser., 2 (1930), pp. 1–64, figs. 8; Latin abs., pp. 52, 53*).—The chemical behavior and products in presence and in absence of light are described.

Plant buffer systems in relation to the absorption of bases by plants, T. C. Dunne (*Hilgardia [California Sta.], 7 (1932), No. 5, pp. 207–234, figs. 6*).—The author presents the results of a study of the buffer systems of the saps of plants obtained by expression. All work was done on sap expressed from tissues that had been frozen and thawed.

Organic acids, amides, amino acids, phosphates, and sugars appeared to be the substances of most importance for consideration. It is suggested that in studies on plant metabolism, titration curves may be a useful means of ascertaining large changes in some of the organic constituents of the sap.

It was found that a low phosphate supply resulted in an increase of H-ion concentration and buffer in the sap. This was considered to indicate an increase in organic acids, amides, amino acids, and possibly sugars. Similar changes were said to occur as a result of low potassium supply.

Calcium was not found to be an indispensable part of the buffer system of the plants. Plants grown with a low calcium supply did not necessarily show an increase of H-ion concentration in the sap, nor were they always injured. Under these conditions, the base necessary for the buffer system was supplied by an increased absorption of potassium.

When the oxalate system in buckwheat was investigated, a large proportion of the oxalate was found usually in an insoluble form. The data obtained indicated that this might be precipitated either with calcium or potassium. The theory that calcium carbonate is necessary for the neutralization of organic acids in such plants was not substantiated.

The direct current resistance of Nitella, L. R. Blinks (*Jour. Gen. Physiol., 13 (1930), No. 4, pp. 495–508, pls. 2, figs. 2*).—When the electrical resistance of Nitella cells to direct current is determined with a Wheatstone bridge, using a vacuum tube detector and string galvanometer and passing through very

small currents to avoid stimulation, the galvanometer record shows typical transient effects in the living cells at both opening and closing of the circuit, due to the development of back electromotive force. The resistances are discussed.

"Electrical stimulation causes a marked reduction of resistance, which may be due to exomosis of KCl."

Radioexcitation and radioinjury [trans. title], E. INGBER (*Atti Ist. Bot. R. Univ. Pavia, 4. ser., 2 (1930), pp. 111–116, 173–268, figs. 34; Latin abs., pp. 116, 252*).—In the first of these two papers the author gives a brief preliminary account of studies regarding phases and phenomena following treatment of *Vicia faba minor* with Röntgen rays. The second paper continues this study and gives an extensive bibliographical review of the work of others.

Self- and cross-fertility and flowering habits of certain herbage grasses and legumes, together with studies in bulb development and spikelet characters in Arrhenatherum (*Welsh Plant Breeding Sta., Aberystwyth, [Bul.], Ser. H, No. 12 (1921–1930), pp. 240, pls. 2, figs. 2*).—In a prefatory note by R. G. Stapledon to this collection of papers by different authors, it is stated that in work indicated as extending over 10 years at Aberystwyth data have been incidentally collected on points of scientific interest and practical value to the plant breeder. "An endeavor has been made in this bulletin to collect together all the evidence bearing upon the important question of self- and cross-fertility, and upon some other specific and varietal characteristics of general interest which have come under notice." The matter dealt with is regarded as complementary to certain papers which are indicated as having recently appeared.

A method for the quantitative determination of bacteriophage, A. P. KRUEGER (*Jour. Gen. Physiol., 13 (1930), No. 5, pp. 557–564, figs. 2*).—In a study of staphylococcus and antistaphylococcus in which the total volume of the mixture was kept constant, there was found to exist a definite relationship between C_{phage} and the time required to produce a particular concentration of growing phage-susceptible bacteria to an arbitrary turbidity end point. This relationship is said to supply a basis for quantitative estimation of bacteriophage, a method for which is described as being accurate within ±5 per cent.

GENETICS

The methods of statistics, L. H. C. TIPPETT (*London: Williams & Norgate, 1931, pp. 222, figs. 12*).—Descriptions are given of the methods used in statistics, especially in their application to biological problems.

Ruthenium tetroxide as a fixative (*New York State Sta. Rpt. 1932, p. 46*).—The use of this salt as a fixative in cytological work is noted.

An evaluation of size genes, C. V. GREEN (*Amer. Nat., 66 (1932), No. 707, pp. 566–568*).—By an analysis of the variance in the size characters previously noted (E. S. R., 67, p. 231) as to the portion due to genes linked with color genes, the author concludes that the linked size genes account for a distinct, although perhaps minor, portion of the variance in the respective size characters. The standard deviation due to a specific gene linked with a color factor was determined by the formula $\sqrt{q(1-q)D^2}$, in which q is the proportion in one color class, $1-q$ is the proportion in the allelomorphic color class, and D is the difference between the means. The ratio of the variance, determined by this formula, to the standard deviation of the total population gives the degree of determination except for sampling differences.

Probability tables for Mendelian ratios with small numbers, B. L. WARWICK (*Texas Sta. Bul. 463 (1932), pp. 28*).—The probabilities through the fourth

decimal place of the combinations in nine of the more common Mendelian ratios are presented, based on the expansion of the binomial $(p+q)^n$, for n from 1 to 50. A supplementary table gives the number of recessives expected with probabilities of 0.0050 or greater not shown in the detailed table for the more complicated Mendelian ratios.

Chromosome numbers in the genera Baptisia, Thermopsis, and Lathyrus [trans. title], M. Simonet (*Compt. Rend. Acad. Sci. [Paris], 195 (1932), No. 18, pp. 738–740*).—Chromosome counts in the pollen mother cells showed $n=9$ in *T. montana* and in 2 species of Baptisia and $n=7$ in 24 species of Lathyrus.

Chromosome rings in maize and Oenothera, R. A. Brink and D. C. Cooper (*Natl. Acad. Sci. Proc., 18 (1932), No. 6, pp. 447–455, figs. 4*).—The essential differences in the properties of the chromosome rings in Oenothera and in corn are discussed, and their possible causes are indicated.

A strain of maize homozygous for segmental interchanges involving both ends of the P-br chromosome, R. A. Brink and D. C. Cooper (*Natl. Acad. Sci. Proc., 18 (1932), No. 6, pp. 441–447, figs. 7*).—Certain phases of the cytological behavior of hybrid plants derived from semisterile-1 (E. S. R., 67, p. 226) × semisterile-5 corn are described from studies at the Wisconsin Experiment Station.

Studies in the inheritance of physiological characters.—II, Further experiments upon the basis of hybrid vigour and upon the inheritance of efficiency index and respiration rate in maize, E. Ashby (*Ann. Bot. [London], 46 (1932), No. 184, pp. 1007–1032, figs. 5*).—Experiments (E. S. R., 63, p. 325) begun in London were repeated and extended at the University of Chicago. Two inbred lines of corn were grown together with their reciprocal crosses, and in one instance the F_2 generation. Plants were sampled for dry or wet weights at regular intervals for estimates of the hybrid vigor and of the efficiency indices of the various populations.

The F_1 hybrids all exhibited considerable hybrid vigor. The higher of the two parental efficiency indices always appeared in the hybrid as a complete dominant, showing that hybrid vigor in these strains could not be attributed to possession of a greater efficiency index. The greater embryo weight in the hybrid grain is held to account for the presence of hybrid vigor without increase in the efficiency index of the hybrid. Different embryo weights account for the different degrees of hybrid vigor exhibited by reciprocal crosses having the same genetic constitution and the same efficiency index. A hypothesis put forward is that embryo weight is determined largely by the influence of the mother plant during maturation of the seed. In F_2 there was a segregation of the higher and lower efficiency indices inherited from the grandparents. The respiration rate, based on dry weight, appeared to be inherited in F_1 as a simple dominant.

Inheritance of fluorescence in rye-grass, L. Corkill (*Nature [London], 130 (1932), No. 3273, p. 134*).—Fluorescence of roots under ultra-violet light, a character found in Italian ryegrass and strains of false perennial but not in true perennial ryegrass, seemed to depend on a single Mendelian factor, with ratios of about 3 fluorescent to 1 nonfluorescent seedling. The relations between fluorescence and some botanical characters of the plants are commented on.

Re-assembling the factors for awns and for spike density in Sevier × Federation wheat crosses and back crosses, G. Stewart (*Jour. Amer. Soc. Agron., 24 (1932), No. 11, pp. 843–861, figs. 4*).—In a cross between Sevier and Federation wheat (E. S. R., 59, p. 127) studied at the Utah Experiment Station, two factors for awns with a suggestion of linkage and a peculiar spike density inherited were indicated. Repetition of the cross showed spike density

behavior to be similarly peculiar in that wide transgressive segregation was found, some progenies exceeding either parent in density while others were more lax than either parent. In awn behavior there were 4 true-breeding awn classes, 1 like each parent, and 2 intermediates. The suggestion of linkage appeared as in the original cross. When the 2 intermediate forms were crossed, the F_2 plants and F_3 progenies showed that the grandparental types, awnless as in Federation and fully awned as in Sevier, were restored along with the intermediates. Back crosses of Federation on each intermediate awn class revealed a single-factor difference between the awnless parent and each intermediate, and established the correctness of the awn classes set up in the original study. There was evidence that the awnless wheat is recessive. A one-factor difference was found between the spike density of the lax parent and a dense-spiked segregate.

Shape changes during fruit development in Cucurbita and their importance in the study of shape inheritance, E. W. Sinnott (*Amer. Nat., 66 (1932), No. 705, pp. 301–309, figs. 4*).—Continuing studies (E. S. R., 66, p. 624) at Columbia University, the author presents evidence to show that small ovary primordia are more accurate for the determination of shape indexes of a population segregating for shape than are the mature fruits. This method has the added advantage of making possible a much larger number of determinations for each plant and of eliminating minor shape differences which appear during development. The author believes that there are two types of shape factors, major ones which divide plants into sharply different types and minor ones which modify slightly the direction and rate of shape change during development.

Cytological aspects of breeding nuts, B. R. Nebel (*North. Nut Growers Assoc. Proc., 22 (1931), pp. 22–24*).—Discussing briefly the processes of cell division and gametogenesis in general, the author asserts that there are 34 diploid chromosomes in *Juglans nigra, J. regia,* and certain hybrids, and that *Corylus avellana* has 28 diploid chromosomes.

Studies on the species crosses of Japanese Rhododendron.—I, On the crossability between various species and the cotyledon color of F_1 seedlings, Y. Noguchi (*Japan. Jour. Bot., 6 (1932), No. 1, pp. 103–124, pls. 2*).—In crosses involving 16 species of Rhododendron it was found that those species belonging to the section Tsutsusi crossed freely, and intersectional hybrids were obtained in the case of *R. japonicum*×*R. degronianum, R. japonicum*×*Azalea* (*Rhododendron*) *schlippenbachi,* and *R. mucronulatum*×*A. yodogawa* (*R. yedoense*). Chlorophyll defects were observed in the cotyledons of certain hybrids, particularly those between *R. japonicum* and species in the Tsutsusi section.

[Genetic studies with dairy cattle and poultry] (*Illinois Sta. Rpt. 1932, pp. 106, 107, 113, 114*).—Data on fetal development in dairy cattle, including measurements and chemical analyses of fetuses of various ages, are reported from work by W. W. Yapp.

The results of experiments with poultry by E. Roberts and L. E. Card are briefly noted on the effect on egg production of operations involving scarification or mutilation of the ovarian tissue of hens which were good layers; the segregation of factors for resistance to bacillary white diarrhea in selections from crossbreeds produced by mating resistant with unselected strains; and the inheritance of differences in broodiness and egg production in crosses of Cornish and Single Comb White Leghorns.

[Animal breeding investigations at the Oklahoma Station] (*Oklahoma Sta. [Bien.] Rpt. 1931–32, pp. 87–96, fig. 1*).—Accounts are given of the progress

made in studies of the inheritance of swirl hair in swine, and of inbreeding and outbreeding swine, by W. A. Craft; heritable defects in beef cattle, by Craft and W. L. Blizzard; and physiology of reproduction in sheep, by A. E. Darlow and L. E. Hawkins.

A contribution to the inheritance of body form and skeleton [trans. title], W. Spöttel (*Züchtungskunde, 7 (1932), No. 8, pp. 296–308, fig. 1*).—After discussing the results of different crosses of wild and domestic breeds of cattle and sheep, the author concludes that the expected amounts of segregation are apparent in weight and skeletal form.

Breeding for milk, J. Hammond (*Agr. and Livestock in India, 2 (1932), No. 2, pp. 176–180*).—A popular account of the importance of progeny tests of sires and the concentration of the blood of outstanding producers by inbreeding.

Observations on the color inheritance of heterozygous black and brown Karakul rams in crosses with sheep of different breeds [trans. title], H. Lüthge (*Züchtungskunde, 7 (1932), No. 8, pp. 289–296, fig. 1*).—Data are presented on crosses of heterozygous black and brown Karakul rams with ewes of several other breeds at the University of Halle. There were produced 37 black and 44 brown lambs from crossing a heterozygous black ram with ewes of several breeds, indicating that black behaved as a simple dominant. Matings of brown Karakul rams with ewes of other breeds produced 130 browns except when crossed with Somali ewes, in which case 8 lambs were black and 1 was brown.

A more detailed study of the browns showed considerable variation in the shades and markings of the lambs.

Inheritance of colour in Bellary sheep, T. Murari (*Agr. and Livestock in India, 2 (1932), No. 2, pp. 160, 161, pl. 1*).—These sheep are of three color types, black-face-white, black, and white, and data are recorded on the color characteristics of the lambs produced by matings of black-face-white and pure white rams with ewes of the three colors. It is concluded that black and white are pure, and that black-face-white is the mixed dominant which indicates a single factor for black and a single factor for white in their inheritance. The only crosses in which large numbers were produced involved matings of black-face-white rams with black-face-white and black ewes. Sixty-four lambs were produced in the former cross, of which 33 were black-face-white, 22 black, and 9 white. Forty lambs were produced in the latter cross, of which 22 were black-face-white and 18 were black.

The inheritance of hair color in swine [trans. title], C. Kosswig and H. P. Ossent (*Ztschr. Zücht., Reihe B, Tierzücht. u. Züchtungsbiol., 22 (1931), No. 3, pp. 297–383, figs. 98*).—A detailed discussion is given of the genetic factors responsible for the different color characteristics in swine, involving the breeding of 882 offspring from crosses and back-crosses of several black, red, and white breeds. It is suggested that a quadruple allelomorphic series, Rub_{ep} (epistatic black), Rub_{p} (hypostatic black), rub_{it} (Dalmatian striping), and *Rub* (red) best explains the inheritance of these colors. In the presence of Rub_{hyp} another closely linked factor, *Uni*, caused the wild color. The factor *uni* resulted in a single color determined by the other allelomorphic series. Numerous modifying factors also appeared to operate. The suggestions by other workers of both dominant and recessive white breeds were confirmed.

The color factors in swine are also compared with those in other mammals.

Inheritance studies and observations on swine, III [trans. title], C. Kronacher and A. Ogrizek (*Ztschr. Zücht., Reihe B, Tierzücht. u. Züchtungsbiol., 25 (1932), No. 1, pp. 3–43, figs. 24*).—The mode of inheritance of the colors introduced in the crosses previously noted (E. S. R., 65, p. 327) has received

continued study, data being obtained on 40 parents, 473 F_1, 340 F_2, 13 F_3, and 266 back-cross offspring from crosses of the several breeds.

The results indicated the allelomorphic nature of black, Dalmatian striping, and red, and a slight amount of linkage between the red and black series and uniform color and the dominant wild pattern. In general white was dominant, but in crosses of white Edelschwein with Tamworth dominance was incomplete. The incomplete dominance of the white in the Edelschwein breed was also exhibited in contrast with the black of the Cornwalls, in which the F_1s were blue-gray. This suggests a recessive white.

The whole paper deals largely with a discussion of the results of Kosswig and Ossent noted above.

In an appendix the inheritance of body form in a cross between the Tamworth and Edelschwein breeds is discussed, without very positive findings except that mortality was very high and vigor low in the 87 F_2 pigs.

Inheritance of whorls in the hair of swine, J. E. Nordby (*Jour. Heredity, 23 (1932), No. 10, pp. 397–404, figs. 4*).—A study of the inheritance of hair whorls in swine at the Idaho Experiment Station, based on 104 pigs produced by two smooth-haired boars and their descendants, indicated that hair whorls were due to the interaction of two dominant factors. If whorls are to be eliminated from the herd, both the sire and dam of pigs showing whorls must be discarded because each must carry one or the other of the two factors for hair whorls.

On the genetic nature of the time of attainment of puberty in the female mouse, L. Mirskaia and F. A. E. Crew (*Quart. Jour. Expt. Physiol., 20 (1930), No. 4, pp. 299–304, figs. 3*).—A study of the age at which the first oestrum and the first matings occurred and the percentage of pregnancies following matings at early oestrous periods in albino and colored strains of mice kept under the same conditions showed that the two stocks differed in the age of attaining the first oestrum, the averages being 39 days for albinos and 51.6 days for the colored stock. The cornified condition lasted 2 days in the albino and 1.56 days in the colored stock. As the percentage of pregnancies following matings at the first, second, and third oestrous periods were similar in the two stocks, nongenetic factors are considered responsible for these variations.

A color-mosaic in the mouse, J. J. Bittner (*Jour. Heredity, 23 (1932), No. 10, pp. 421–423*).—A mosaic mouse which showed a brown dorsal and a dilute brown ventral surface is described. Hairs of the opposite type were scattered over both of the areas. The mosaic was produced by mating an F_1 male from a cross of albino (carrying brown) × dilute brown with a dilute brown female. Since the mosaic did not transmit brown in matings with dilute brown and heterozygous brown, it was concluded that the exceptional condition was due to nondisjunction or a somatic mutation.

Congenital taillessness in the rat, F. B. Hutt and O. Mydland (*Jour. Heredity, 23 (1932), No. 9, pp. 363–367, figs. 2*).—A tailless male rat is described which, after breeding tests, was concluded to be nongenetic because no tailless offspring were produced in the F_1 and F_2 generations from matings of nonrelated stocks. Anatomical studies showed only a single caudal vertebra.

The incidence of mammary cancer in a cross between two strains of mice, C. C. Little and B. W. McPheters (*Amer. Nat., 66 (1932), No. 707, pp. 568–571*).—Data are reported on the incidence of cancer in the F_2 generation of a cross between a nonyellow line of mice in which the rate of occurrence of mammary carcinoma is high and a yellow line lower in carcinoma incidence. There were 38.97±2.81 per cent of cancerous mice among the yellows and 59.70±2.85 per cent among the nonyellows in the F_2 population. An analysis

of the data suggested linkage between factors for mammary cancer and non-agouti rather than a difference in the metabolic rate as the primary cause of the difference in cancer incidence in the two strains.

The incidence of sterility amongst tortoiseshell male cats, R. C. BAMBER (BISBEE) and E. C. HERDMAN (*Jour. Genetics, 24 (1931), No. 3, pp. 355–357*).—Information is assembled on the fertility of the 14 recorded male tortoiseshell cats. This shows that 3 were certainly fertile, 4 certainly sterile, and 1 probably sterile. The data were incomplete on the others.

Studies on the creeper fowl.—III, The early development and lethal expression of homozygous creeper embryos, W. LANDAUER (*Jour. Genetics, 25 (1932), No. 3, pp. 367–394, pls. 3*).—A report is given of the growth rate of the embryos of homozygous creeper fowls which die at the beginning of the fourth day of incubation. As no gross malformations were found in such embryos, lethal action appears to be brought about by cessation of growth.

The relation of feather pigmentation to intensity of laying in Rhode Island Reds, F. A. HAYS (*Massachusetts Sta. Bul. 288 (1932), pp. 8*).—From a study of the relationship of feather pigmentation in Rhode Island Reds to the age at first laying, winter clutch size, winter production, and annual production based on breeding records of light and dark strains carried through four generations, the author concludes that deep plumage color occurs generally in slow-maturing birds and that a developmental period greater than 215 days from hatching to sexual maturity seems to be required to develop the dark plumage of exhibition Rhode Island Reds.

The annual egg production was not significantly different in the dark and light lines in any of the four generations.

It appears that the medium shade of red is more typical of birds bred for high fecundity than a very dark or a very light shade.

The development of the phallus in the fowl [trans. title], D. HASIMOTO (*Bul. Miyazaki Col. Agr. and Forestry, No. 2 (1930), pp. 35–43, pls. 5; Eng. abs., p. 42*).—Because of the interest in identifying the sex of chicks at birth, a study is reported of the development of the penis of fowls in the embryonic stages of young chicks. The adult male shows a raised round white body and two round folds in the middle of the ventral wall, just inside the cloacal orifice, which is not found in the female. This body may be traced to the so-called phallus in the early embryonic stage. In the female chick the cephalic portion of the phallus remains only in the form of a flattened fold at hatching, but in the male chicks it remains as a raised body, making sex identification in day-old chicks relatively easy.

Reversal of the secondary sexual characters in the fowl.—A castrated Brown Leghorn male which assumed female characters, A. W. GREENWOOD and J. S. S. BLYTH (*Jour. Genetics, 26 (1932), No. 2, pp. 199–213, fig. 1*).—A case is described of a male Brown Leghorn that was castrated at 51 days of age. Following this, it showed normal capon characteristics until about 70 weeks of age, when the body weight was increasing rapidly and the comb showed rapid development. The comb characters became very much like those of a laying hen, and the feathers showed the female pattern and structure. These characteristics were attributed, on post-mortem and histological examination, to the presence of a small tumor posterior to the normal right gonad site.

Physiological investigations on the spermatozoa of cattle, I [trans. title], I. KOMATSU (*Bul. Miyazaki Col. Agr. and Forestry, No. 2 (1930), pp. 1–20, figs. 7; Ger. abs., p. 20*).—Studies of the influence of temperature and light factors on the duration of life of the spermatozoa of cattle showed that light had a slight deleterious influence on them. Ultra-violet irradiation, however, had little influence. The most favorable temperature for the spermatozoa was

about 12° C. (53.6° F.), but maximum activity was obtained at from 15 to 18° and no injury occurred between 2 and 52°. Spermatozoa retained more motility with from 8 to 11 hours' treatment with ultra-violet light. One to 2 hours' irradiation of the spermatozoa had a favorable influence on fertility.

On the mechanism of ovulation in the rabbit.—IV, Quantitative observations on the action of extracts of urine of pregnancy, M. H. Friedman (*Jour. Pharmacol. and Expt. Ther., 45 (1932), No. 1, pp. 7–18*).—Continuing this series (E. S. R., 67, p. 28) post-partum rabbits were injected with extracts of pregnancy urine, and it was found that ovulation was regularly induced with about 1 rat unit of the hormone per kilogram of live weight. By the administration of submarginal doses for ovulation, luteinization of the unruptured follicles was induced. Because of the uniformity in the reaction obtained it is suggested that post-partum rabbits be further tested as to their use in the bioassay of gonad-stimulating extracts.

On the mechanism of ovulation in the rabbit.—V, The effect of direct intrafollicular injections of extracts of urine of pregnancy, M. H. Friedman (*Amer. Jour. Physiol., 99 (1932), No. 2, pp. 332–337, fig. 1*).—In continuing this series, the effect of direct intrafollicular injections of extracts of the urine of pregnancy on the development of corpora lutea was studied. In each case one ovary was exposed under ether anesthesia and the large follicles irrigated with extracts of pregnancy urine. The results showed that it was possible to luteinize the injected mature ovarian follicles in this way. Thus corpora lutea were produced unilaterally in the absence of general humoral changes, but in these corpora lutea regression occurred much earlier than during pregnancy or pseudopregnancy, and it was impossible to demonstrate any functional activity on the part of the unilateral corpora lutea.

The effect of various methods of administration of pregnancy urine on the ovary of the rat, M. C. Shelesnyak and E. T. Engle (*Anat. Rec., 53 (1932), No. 2, pp. 243–248*).—No consistent differences were observed in the induction of superovulation in rats by administering an extract of pregnancy urine into the heart or as dry powder, deposited in capsules or as tablets, applied under the skin or in the muscle.

The preparation of gonadotropic hormones from normal urine and urine of pregnancy, C. Funk and P. Zefirow (*Biochem. Jour., 26 (1932), No. 3, pp. 619–621*).—A purified extract of the hormone from pregnancy urine was administered to immature male rats and the effectiveness satisfactorily tested by the increase in the size of the seminal vesicles.

The effect of oestrin on the testis of the adult mouse, M. Allanson (*Jour. Expt. Biol., 8 (1931), No. 4, pp. 389–392, pl. 1*).—Subcutaneous injections of 340 mice units per day of oestrin in male mice for 15 and 21 days following the removal of one testicle as a control had no influence on the development of spermatozoa or in producing degenerative changes in the remaining testicle. Subsequent matings were fertile.

The effect of theelin and theelol on the growth of the mammary gland, C. W. Turner, A. H. Frank, W. U. Gardner, A. B. Schultze, and E. T. Gomez (*Anat. Rec., 53 (1932), No. 2, pp. 227–241, figs. 14*).—In studies at the Missouri Experiment Station theelin and theelol were found to stimulate growth in the duct system of the mammary glands of normal and castrated female rabbits and rats. Initial studies with male mice were negative, but with increases in the dose growth of the ducts was stimulated. The growth induced by theelin and theelol was said to be of about the same general nature as that resulting from injections of the crude extract of the urine from pregnant dairy cattle.

FIELD CROPS

[**Agronomic research in Arkansas**], M. Nelson, J. O. Ware, C. K. McClelland, R. P. Bartholomew, J. W. Jones, C. R. Adair, O. A. Pope, J. R. Cooper, and V. M. Watts (*Arkansas Sta. Bul. 280 (1932), pp. 9–20, 24–32, 50, 51, 52*).—These pages report the progress of experiments with field crops (E. S. R., 66, p. 525) at the station and substations comprising variety tests with cotton, corn, wheat (E. S. R., 68, p. 188), winter and spring oats, rice, grain sorghum, sorgo for sirup, and soybeans and cowpeas for seed and hay; trials of mung beans; breeding work and genetic studies with cotton and rice, and selection of cotton for oil and protein content; fertilizer trials with cotton, with corn, wheat, oats, and clover in rotation, and with alfalfa, rice, potatoes, sweetpotatoes, and sugar beets; study of the fertilizing effects of winter legumes on cotton and of legumes on corn and oats; time of plowing under cover crops for corn and rice; crop rotations variously fertilized; cultural (including planting) tests with cotton, corn, oats, rice, soybeans, and alfalfa; effect of corn cultivation on nitrate and moisture content of the soil (E. S. R., 67, p. 368); tillering in corn; interplanting of legumes in corn; cutting tests with alfalfa; seed treatment for oat smut; control of rice weeds; and cotton fiber investigations concerned with the effects of soil type and of different rates and formulas of fertilizers. The cotton fertilizer studies considered formulas, rates of application, placement, home v. factory mixed, nitrogen carriers, and effects of nitrogen, phosphorus, and potassium on the fruiting of cotton (E. S. R., 67, p. 669).

[**Field crops research in Colorado**], A. Kezer, L. W. Durrell, E. Douglass, and E. P. Sandsten (*Colorado Sta. Rpt. 1932, pp. 12–16, 17–19, 29, 32–34, 50*).—These pages report the progress of agronomic investigations at the station and substations, including data from variety trials with corn, oats, barley, potatoes, alfalfa for yield and wilt resistance, red clover, and field peas; breeding work with corn, oats, barley, and potatoes; an inheritance study with barley (E. S. R., 67, p. 375); control of wheat foot rot; an experiment on the deterioration in quality and vitamin content of alfalfa hay cut in several growth stages and variously cured and damaged by rain; irrigation experiments concerned with the critical period for the need of water in growing crops, as wheat, and the residual effects of irrigation on succeeding crops, as wheat, potatoes, and sugar beets; and weed control studies. Certain lines of work were in cooperation with the U. S. Department of Agriculture.

[**Field crops investigations in Illinois**] (*Illinois Sta. Rpt. 1932, pp. 13–15, 38, 39, 40–43, 44–53, 55–69, 127, figs. 5*).—Continued research by E. E. DeTurk, J. C. Anderson, L. E. Kehoe, F. C. Bauer, E. B. Earley, J. J. Pieper, W. L. Burlison, C. A. Van Doren, J. C. Hackleman, C. M. Woodworth, O. H. Sears, M. F. Hershberger, W. P. Flint, W. J. Mumm, G. H. Dungan, B. Koehler, D. C. Wimer, O. T. Bonnett, L. E. Allison, R. E. Fore, and W. P. Hayes with field crops (E. S. R., 66, pp. 220, 223) as reported on included variety trials with corn, winter and spring wheat, oats, barley, buckwheat, alfalfa, red clover (strains), soybeans, seed flax, hemp, safflower, and Jerusalem-artichoke; breeding work with corn for oil and protein content, wheat, oats, barley, and soybeans; improvement of corn by top crossing and by reconstitution and for resistance to the European corn borer; inheritance studies with soybeans for ability to become inoculated, and with wheat; cultural (including planting) tests with corn, wheat, soybeans, red clover, and Jerusalem-artichokes; stage of maturity for selecting seed corn; effects of storage on treated seed oats and on home-grown and northern-grown seed potatoes; studies of tillering in barley and of recovery of corn damaged by hail; fertilizer tests with corn; fertility

value of cornstalk ash and residues and of straw for soil improvement; tests of legumes for green manure; effects of legumes in rotations; improving the yield and quality of forage crops; germination studies with soybeans; the response of red clover and lespedeza varieties to inoculation and the limitation of inoculation by seasonal conditions; tests of chlorates on weeds; and life history and control studies with wild garlic and onions.

[Field crops research in Oklahoma, 1930–1932], H. J. Harper, H. F. Murphy, B. F. Kiltz, J. C. Ireland, C. B. Cross, L. L. Ligon, H. W. Staten, H. H. Finnell, J. E. Webster, G. W. Cochran, and G. F. Burk (*Oklahoma Sta. [Bien.] Rpt. 1931–32, pp. 16–25, 25–59, 186, 235, 236, 240, 241, figs. 5*).—Experiments with field crops (E. S. R., 64, p. 732) at the station, the Panhandle Experiment Station, and elsewhere in the State, reviewed for the above period, included variety tests with cotton, corn, wheat, oats, barley, grain sorghum, sorgo, alfalfa, sweetclover, cowpeas, soybeans, mung beans, miscellaneous grasses, and clovers and mixtures; trials of tepary beans; breeding work with cotton, corn, wheat, grain sorghum and broomcorn, alfalfa, sweetclover, and Austrian winter peas; cultural (including planting) experiments with cotton, corn, wheat, oats, grain sorghum, and peas and vetch; effect of terracing dry land on wheat yields (E. S. R., 66, p. 181); size of seed tests with wheat and cotton; seed treatments with corn, sorghum (E. S. R., 67, p. 270), and potatoes (E. S. R., 68, p. 323); fertilizer trials with cotton, wheat, alfalfa, sweetclover, potatoes, sweetpotatoes, pasture grasses, and native meadows; inoculation studies and trials of legumes as green manures for cotton, wheat, and alfalfa; analyses of soybeans for iodine number and oil and protein content; pasture research considering legumes on native soil and with Bermuda grass, simulated grazing of native grasses, and trials of cereals and legumes for winter pasture (E. S. R., 65, p. 129); lawn and golf green experiments; studies of the protein content of wheat (E. S. R., 66, pp. 136, 826); reducing costs of wheat production (E. S. R., 65, p. 734); farm utilization of cheap wheat in the home (E. S. R., 66, p. 88), as a dairy cow feed (E. S. R., 65, p. 767), and for fattening pigs (E. S. R., 67, p. 301); and studies of strength and uniformity of cotton lint as affected by date of blooming and maturity, soil fertility, erosion, and wilt. Certain lines of work were in cooperation with the U. S. Department of Agriculture.

[Crop production research in the Southern States] (*Assoc. South. Agr. Workers Proc., 32 (1931), pp. 24–35, 44–104*).—Papers of agronomic interest presented at the convention of the Association of Southern Agricultural Workers at Atlanta, Ga., February 4 to 6, 1931, included A Land Policy (pp. 24–35) and Researches of the Bureau of Chemistry and Soils in the Interest of Southern Agriculture (pp. 44–55), both by H. G. Knight; Problems Pertaining to soil Erosion in the South, by R. Y. Winters (pp. 56–59); Machine Applications of Fertilizers for Cotton, by W. H. Sachs (pp. 59–63); The Effect of Spring Legumes upon Productivity of the Soil, by M. Nelson (pp. 63–68); The Cation Exchange Properties of Soils and the Availability of Plant Nutrients, by H. P. Cooper (p. 69); Varietal Adaptation of Alfalfa in the Prairie Lime Belt of Alabama and Mississippi, by T. F. Akers (pp. 70–74); New Varieties of Soybeans, by H. A. York (pp. 75–78); Registration of Cotton Varieties, by H. B. Brown (pp. 79–82); The Value of Winter Legumes in Maintaining Soil Fertility, by R. Y. Bailey (pp. 82–86); Unproductiveness in Certain Soils and the Use of Calcium Arsenate, by W. B. Albert (pp. 86–90); Permanent Pastures for the South, by J. R. Ricks (pp. 90–98); and The Production of Florida Pasture Plants as Indicated by Frequent Mowings in Experimental Pastures, by G. E. Ritchey (pp. 99–104).

Key for the identification of important meadow and pasture plants in flowerless condition, J. A. HUBER (*Schlüssel zum Bestimmen der Wichtigsten Wiesen- und Weidepflanzen (Gräser, Kräuter und Kleearten) im Blütenlosen Zustande. Berlin: Paul Parey, 1931, pp. 70, figs. 83*).—Determinative keys, devised to aid in identifying grasses, clovers and weeds found in meadows and pastures by their vegetative characters, are presented together with indexes of common German and scientific names.

A comparison between the effects of ammonium sulphate and other forms of nitrogen on the botanical composition of closely cut turf, G. E. BLACKMAN (*Ann. Appl. Biol., 19 (1932), No. 4, pp. 443–461, figs. 7*).—In an earlier study (E. S. R., 68, p. 35) periodic application of ammonium sulfate to closely cut turf was observed to cause a reduction in weeds (plants other than grasses) without producing significant changes in soil reaction. Evidence is here reported that such reduction is due to the direct action of the ammonium ions. Botanical analyses of small plats on a uniform piece of turf, treated, respectively, with ammonium dihydrogen phosphate, sodium nitrate, urea, dilute sulfuric acid, and ferrous sulfate alone and in combination with ammonium sulfate, showed that a statistically significant reduction in total weeds was brought about only by the ammonium compounds. Most weeds, as *Achillea millefolium*, were reduced, whereas *Cerastium vulgatum* increased significantly, but the addition of ferrous sulfate inhibited this increase. All the nitrogenous treatments produced some changes in the grasses, species of Poa increasing at the partial expense of *Festuca ovina*, but the grasses did not change with other treatments. Due to the high chalk content of the soil, there were no significant changes in reaction apart from the small increase in alkalinity caused by sodium nitrate.

Information concerning inoculation of legumes, C. F. BRISCOE (*Mississippi Sta. Circ. 95 (1932), pp. 7, figs. 2*).—Practical information is given on the characteristics and functions of nodule bacteria, the purposes of inoculating seed of legumes, and on good cultures and how to use them.

Experiments with growing corn and soybeans in combination, H. L. BORST and J. B. PARK (*Ohio Sta. Bul. 513 (1932), pp. 26, figs. 4*).—In experiments at Columbus, nine soybean varieties grown in corn for silage on two soil types, from 1920 to 1924, inclusive, produced varying percentages of soybeans in the crop mixture, the sorts making high percentages of soybeans seeming to reduce corn yields more than other varieties. Higher total yields of mixed forage resulted where soybeans producing the high percentages of the crop were used. The percentages of soybeans in the crops harvested were slightly greater and the plants were more erect on the poorer soil (Miami) than on the richer soil (Brookston.)

Corn and soybeans were grown alone and together in various combinations of thick, medium, and thin planting rates within the period 1919–1929, and were harvested by hand. The planting rate seemed important since it may determine the productiveness of the mixture as compared to corn alone. Indications were that silage yields from corn v. corn and soybeans should not be compared on the green-weight basis, since the soybeans may differ from corn in moisture content. Soybeans grown with corn also reduced the yield of corn silage or grain as compared with corn alone regardless of the planting rate. The advantage accruing from soybeans planted with corn for silage decreased as the corn was planted thicker. In both medium and thin corn the total yield of the combination in air-dry matter, total nutrients, and protein increased as the soybeans were planted thicker, while in thick corn the addition of soybeans or increase in their planting rate increased the yield of protein somewhat but not the total digestible nutrients.

With thick and medium corn for grain, soybeans did not increase total digestible nutrients in the mixed grain over corn alone, whereas with thin corn, soybeans at the thick and thin rates increased the total nutrients slightly. Increasing the rate of planting the soybeans with corn planted at any of the three rates decreased the yield of total nutrients in the grain mixture, but increased the yield of protein. At any given rate of planting soybeans the protein yield rose as the rate of planting corn decreased, the combination producing the most protein being corn thin and soybeans thick, while corn alone medium produced the greatest yield of total digestible nutrients in the grain.

Plantings at about medium rates on fertile bottom land, 1920–1923, inclusive, and harvested with a corn binder gave indications that under conditions of high fertility with a rank growth and high yield of corn, planting soybeans with the corn is of no advantage, confirming foregoing results.

Growing the mixture for silage had little to recommend it even under favorable conditions and where most of the soybeans grown in the corn are saved. The small increase in protein obtained in the second experiment could be offset under field conditions by soybeans lost in harvesting. The combination might have more practical value for hogging than for silage, in which case a low rate of planting soybeans would be desirable.

Parent-progeny correlations in corn, J. F. O'Kelly and W. W. Hull (*Jour. Amer. Soc. Agron., 24 (1932), No. 11, pp. 861–867*).—Parent-progeny correlations studied in connection with corn breeding work at the Mississippi Experiment Station from 1925 to 1930, which involved 4 varieties in a modified plant-to-row method, showed correlations of yield with yield and yield with grain percentages each to give 15 positive and 4 negative coefficients, and grain percentage with yield 16 positive and 3 negative. The coefficients were too small to be of much significance. Grain percentage was highly correlated with grain percentage. It appeared that a system of corn improvement must use measures other than studies of the selected plant's characteristics.

Cotton culture in French West Africa, L. Robert (*La Culture du Coton en Afrique Occidentale Française. Paris: F. Loviton & Co., 1931, pp. X+115+ [2]*).—This treatise discusses general conditions in the African cotton industry; gives details of cotton production in Upper Volta, Ivory Coast, Sudan, Dahomey, Niger, Senegal, Guinea, and Mauritania; and describes the status of the industry in the region, with a list of various agencies interested in the enterprise. A bibliography is appended.

An investigation of the taxonomic and agricultural characters of the Danthonia group, A. B. Cashmore (*Aust. Council Sci. and Indus. Res. Bul. 69 (1932), pp. 22, pl. 1, fig. 1*).—The taxonomic position of the genus Danthonia in Australia is described, with a review of literature (37 titles) and an account of studies at the Waite Institute concerned with pollination, germination, establishment, productivity, tillering, and seed production in these grasses.

All of the lines investigated proved to be normally self-fertilized, true-breeding races, and the species groups distinct. The species do not demand high soil fertility, and they can adjust themselves to extremes of rainfall and temperature. When mature, the herbage tends to be coarse and fibrous and somewhat unpalatable, but if maintained at an immature stage by rotational grazing, good yields of highly nutritious fodder may be expected at low water cost. The studies showed the possibility of obtaining better strains for the drier areas where introduced pasture plants can not persist. Selected strains have made more than four tons of hay per acre in the second year, and can compete with exotic weeds when once established. The extended production period of Danthonia and its capacity to produce green feed after rain in hot summers are stressed as of particular value where wool production is the aim. Two new species are described.

Potato culture, H. Werner, rev. by K. Opitz (*Der Kartoffelbau. Berlin: Paul Parey, 1930, 9. ed., rev., pp. [4]+160, figs. 37*).—A revised edition of a work noted earlier (E. S. R., 19, p. 734).

Varietal distinctions of the rape varieties grown in Japan [trans. title], N. U (*Jour. Imp. Agr. Expt. Sta., Nishigahara, Tokyo, Japan, 1 (1931), No. 4, pp. 403–422, pls. 2; Eng. abs., p. 422*).—Important agronomic characters and their variations are described in bilingual tables for a number of varieties of *Brassica campestris, B. napus,* and *B. juncea,* oil seed types, collected throughout Japan and studied at Konosu Experiment Farm. Chromosome numbers observed are listed.

Bibliography on rice and rice culture [trans. title], M. Kondō and S. Isshiki (*Ber. Ōhara Inst. Landw. Forsch., 5 (1932), No. 2, pp. 325–346*).—The list embraces 446 titles of literature concerned with rice varieties; breeding work; genetics; cultural and field practices; soils; fertilizers; nutrition and physiology of the plant; irrigation; plant diseases; and storage, marketing, and utilization of rice.

Sisal: Production and preparation, edited by H. H. Smith (*London: John Bale, Sons & Danielsson, 1929, pp. XXX+384, pls. 13, figs. 28*).—Part 1 of this book, devoted to the production of sisal, includes accounts of practices in India, by H. H. Mann and J. Hunter; in Queensland, by A. J. Boyd; in Ceylon, by G. Harbord; and in Kenya and East Africa, Federated Malay States, Caicos Islands, Mexico, Philippine Islands, Hawaii, Java and Sumatra, and Cuba; distillation of alcohol from sisal refuse; Colombian pita fiber (*Ananas* sp.), by M. T. Dawe; and other phases of sisal production. Part 2 treats of the preparation of the fiber.

[Sugarcane research in Cuba] (*Asoc. Téc. Azucareros Cuba, Proc. Ann. Conf., 4 (1930), pp. 9–58, 64–78, 138–145, figs. 11*).—Papers of interest to agronomists, presented at the fourth annual conference of the Association of Cuban Sugar Technologists and reported in English, include Actual Status of Cane Cultivation in Cuba in Regard to Prevailing Sugar Prices and Influence of Varietal Work Irrigation and Fertilizer in Reducing Costs, by A. Molino (pp. 9–16); Experiences in the Renovation of Old Ratoon Fields of Cristalina through Replanting with New Vigorous Varieties, by R. Menéndez-Ramos (pp. 17–22); The Agricultural Management of Some Important Soil Types, Part II, by J. A. Faris (pp. 23–29); Variety Tests: A Note on Experimental Technique by a Committee, by C. J. Bourbakis, J. A. Faris, and A. Molino (pp. 30–33); Plant Food Balance, by C. E. Beauchamp (pp. 34–43); The Technology of the New Concentrated Fertilizers, by W. E. Dickinson (pp. 44–51); The P. O. J. Canes and Insect Damage, by U. C. Loftin (pp. 52–58); Weed Control on Railroad Tracks, by A. Tinoco (pp. 64–66); Transportation of Cane by Tractors (A Referendum), by A. A. Goytisolo (pp. 67–71); Some Aspects of Cane Irrigation in Cuba, by H. Elizondo (pp. 72–78); and Milling Factors and Invert Sugars in Relation to Comparative Factory Tests of Different Sugar Cane Varieties, by H. G. Sorensen (pp. 138–145).

[Agronomic research of the Hawaiian Sugar Planters' Experiment Station, 1928–1931], J. A. Verret, A. J. Mangelsdorf, G. R. Stewart, C. G. Lennox, F. E. Hance, et al. (*Hawaii. Sugar Planters' Assoc. Proc., 48 (1928), pp. 279–321, fig. 1; 49 (1929), pp. 293–350, figs. 2; 50 (1930), pp. 453–456, 463–466, 469–493, fig. 1; 51 (1931), pp. 621–642, 643–674, figs. 18*).—Experiments, centered around sugarcane and its production and reviewed for the above period, comprised tests of varieties and seedlings; breeding and hybridization work; irrigation studies; fertilizer and liming trials; harvesting experiments; growth and ripening studies; seed preservation tests; analyses of sugarcane

and of irrigation water; the effects of fertilizer constituents on the quality of juice; and effects of less essential elements on the cane plant. Other research included soil surveys and analyses; soil fertility investigations, including a study of causes of root rot; physical and chemical properties of Hawaiian soils; the mineral constituents of soils; soil reaction as affected by fertilizers; and the value of molasses as a soil amendment.

[Sugarcane experiments in Queensland, 1930 and 1931], H. T. Easterby et al. (*Queensland Bur. Sugar Expt. Stas. Ann. Rpts., 30 (1929–30), pp. 1–35, 48–56; 31 (1930–31), pp. 1–36, 48–55, figs. 2*).—Experimental work with sugarcane (E. S. R., 62, p. 52-), reviewed for 1930 and 1931, included variety, cultural, fertilizer, liming, and seed treatment tests; breeding work and propagation of seedlings; studies of field plat technic; trials of cane-harvesting machinery; and research in sugar mill technology. The current status of the industry is described, and data are given on the crops and sugar production in different producing districts.

Fertilizers for sweetpotatoes based on investigations in North Carolina, J. J. Skinner, C. B. Williams, and H. B. Mann (*U. S. Dept. Agr., Tech. Bul. 335 (1932), pp. 47, figs. 14*).—The effects on the growth of young plants and yields of sweetpotatoes, resulting from different fertilizer ratios and quantities per acre, different sources of potash and of nitrogen, concentrated fertilizer, and fertilizer placement and time of application, were studied in cooperation with the North Carolina Experiment Station on several of the principal soil types used for growing sweetpotatoes.

On Norfolk sandy loam, best results were obtained with fertilizers containing a small percentage of phosphoric acid, 3 to 4 per cent ammonia, and 9 to 10 potash; Portsmouth fine sandy loam 3 to 4 per cent ammonia, 3 to 4 phosphoric acid, and 8 to 9 potash; Cecil sandy loam 2 to 4 per cent ammonia, 4 to 6 phosphoric acid, and 7 to 9 potash; and Norfolk loamy fine sand about 3 per cent ammonia, 3 to 6 phosphoric acid, and 6 to 9 per cent potash.

On Norfolk sandy loam, Portsmouth fine sandy loam, and Cecil sandy loam, rates of 750 and 1,000 lbs. per acre gave better yields than smaller or larger quantities, but the increase from 1,000 over 750 lbs. usually was small and of doubtful economy. On Norfolk loamy fine sand, from 1,200 to 1,500 lbs. gave best results.

Synthetic and mineral nitrogen salts on heavy soil types gave as large yields as mixtures of these with organic nitrogen carriers. On Norfolk loamy fine sand, where rates ranging from 1,000 to 1,500 lbs. per acre were used, a 4 per cent nitrogen mixture with nitrogen entirely from mineral sources injured newly set plants and resulted in poor stands and reduced yields. Indications were that fertilizer for sweetpotatoes on sandy soils should derive its nitrogen partly from mineral or synthetic nitrogen and partly from organic materials.

Potassium sulfate and potassium chloride were satisfactory potash sources, producing about the same yields and surpassing kainit on all soils worked with. Kainit as the sole source of potash in an 8 per cent potash mixture at the acre rate of 1,400 lbs. was injurious to newly set plants.

Complete fertilizers with kainit as the potash source and those with sodium nitrate as the nitrogen source caused injury to plants when applied before setting and ridging, but no injury was observed when they were applied as a side dressing or broadcast on top of the plant row after the plants were well rooted. When the fertilizer was applied in the plant row before planting, the concentration of soluble salts in the soil within the root zone of the young plants was sufficient to kill them. Such accumulation of soluble salts was not great where fertilizer containing potassium sulfate or chloride was used or when the nitrogen was derived equally from mineral and organic sources. The percentage

of dead plants in general was correlated with the salt concentration within the root zone. Fertilizers (4–8–8) applied broadcast on top of the plant row or applied as a side dressing after plants were well established caused no injury to young plants and produced larger yields than fertilizers applied in the row before setting.

The concentrated fertilizers, primarily from synthetic chemicals, gave good results on Norfolk loamy fine sand when applied in the furrow before setting, i. e., if applied 10 days before setting and mixed in the soil. Yields from concentrated fertilizers were exceeded by ordinary mixtures made from the older materials. Addition of dolomitic limestone or minor essential elements, as manganese, zinc, copper, boron, and nickel, to concentrated fertilizers did not markedly improve them for sweetpotato production on Norfolk loamy fine sand.

Tobacco, I–III, G. Capus, F. Leulliot, and E. Foëx (*Le Tabac. Paris: Soc. Éd. Géogr., Marit. et Colon., 1929, vols. 1, pp. 418, figs. 121; 2, pp. 430, figs. 139; 1930, vol. 3, pp. 279, figs. 23*).—Volume 1 of this rather comprehensive work treats of the origin, history, botanical and industrial classification, and chemistry of tobacco, cultural methods and harvesting practices, and methods of improving the crop. Volume 2 discusses plant diseases, insect pests, curing, fermentation, and preparing the leaf for market. Volume 3 is concerned with production costs, manufacture of different tobacco products, tobacco in the French colonies, import duties, excise taxes, and governmental tobacco monopolies in the principal countries, the physiological action of tobacco, and uses of tobacco.

Registration of improved wheat varieties, VII, J. A. Clark (*Jour. Amer. Soc. Agron., 24 (1932), No. 12, pp. 975–978*).—New wheat varieties, approved for registration (E. S. R., 67, p. 130) and described with performance records, included Bald Rock (E. S. R., 68, p. 41), a soft winter wheat, and Yogo and Quivira, hard red winter varieties.

An experimental study of the rod-row method with spring wheat, H. K. Hayes, H. K. Wilson, and E. R. Ausemus (*Jour. Amer. Soc. Agron., 24 (1932), No. 12, pp. 950–960*).—Various rates and methods of seeding spring wheat in rod-row trials were compared with several varieties at the Minnesota Experiment Station, in order to determine the most desirable technic. Correction of the rate of seeding in rod-row trials on the basis of differences in average kernel weight did not appear necessary with spring wheat. The hand method of sowing rod rows seemed to be slightly superior to the drill method, although differences obtained were very small and perhaps due to chance. The drill method of seeding was considered satisfactory. Results of tests made in 1926 and 1927, indicating that a heavy rate of seeding in rod-row trials was more satisfactory than a lighter rate, were supported further by a comparison of yields in rod-row and in 1/40-acre plats, conducted only in 1929, with a group of highly selected varieties.

Experiments in wheat production on the dry lands of Oregon, Washington, and Utah, D. E. Stephens, H. M. Wanser, and A. F. Bracken (*U. S. Dept. Agr., Tech. Bul. 329 (1932), pp. 68, figs. 31*).—Resembling closely an earlier publication (E. S. R., 49, p. 828) in scope and in general conclusions, this bulletin reports the continuation in cooperation with the Oregon, Washington, and Utah Experiment Stations of tillage experiments and tests on the rate, date, and depth of sowing wheat at Moro, Oreg., Lind, Wash., and Nephi, Utah, to include the crop season 1929 and in some cases 1930. Production statistics and climatic data are also brought up-to-date.

Winter wheat yields were decreased by fall disking of stubble land plowed early in the spring for fallow, and spring disking increased the yields only

over late spring plowing. Early spring plowing for fallow returned a substantial increase in yields over fall plowing at Moro and Lind and slightly higher yields at Nephi. Varying the depth of plowing from 5 to 10 in. resulted in only slight differences in winter wheat yields. Cultivation of fallow sufficient to control weeds proved profitable. Tillage practices were found to affect accumulation of nitrate nitrogen in the soil, which in turn influenced the growth habit, yield, and quality of the wheat. Harrowing winter wheat in the spring resulted in slightly reduced yields. Comparatively early seeding produced high yields of winter wheat when moisture conditions in autumn were favorable, and early seeding also proved best with spring wheat. Winter wheat yields favored planting with the ordinary drill instead of the furrow drill.

Adaptation of wheat varieties in the Pacific Northwest, E. F. GAINES and E. G. SCHAFER (*Northwest Sci., 6 (1932), No. 3, pp. 98–107, figs. 4*).—The regional and local adaptations of wheat varieties in the Pacific Northwest States are indicated from the results of studies made by the Oregon (E. S. R., 64, p. 734), Washington (E. S. R., 66, p. 32), and Idaho Experiment Stations, and the U. S. Department of Agriculture.

The cold resistance of Pacific coast spring wheats at various stages of growth as determined by artificial refrigeration, J. F. MARTIN (*Jour. Amer. Soc. Agron., 24 (1932), No. 11, pp. 871–880*).—The value of artificial refrigeration in studies of cold resistance in relatively nonhardy wheat varieties and the constancy of relative resistance in different growth periods were studied cooperatively by the Oregon Experiment Station and the U. S. Department of Agriculture, using 12 spring wheat varieties commonly grown in the Columbia River Basin.

The agreement between injury in the field and injury by artificial refrigeration was in general very good. It seemed to make little difference whether response to low temperatures was measured by leaf injury or by plants killed. The percentage of injury in unhardened plants always exceeded that of hardened plants, the hardier varieties showing greater differences than the tender wheats and varietal differences being more sharply defined in the hardened plants. While late heading indicates resistance to cold in many varieties, the association did not appear constant enough to permit the use of time of heading as an accurate index of hardiness in the spring wheats studied. The average leaf injury was less for plants frozen at night than in the day. While varieties were observed to differ less in resistance to low temperature at the boot stage than in earlier growth stages, the differences existing were in agreement with resistance in earlier stages and also with winterkilling under field conditions. Freezing several varieties at the heading stage resulted in similar conclusions.

Regional and seasonal variation in pigmentation of durum wheats, C. E. MANGELS (*Cereal Chem., 9 (1932), No. 5, pp. 485–490, fig. 1*).—Significant regional and seasonal variation in the pigmentation of durum wheats was observed in studies at the North Dakota Experiment Station, whereas cropping systems and preceding crops evidently were minor factors. The Langdon area in North Dakota tended to produce better colored durum wheat than either the Fargo or Dickinson area. Cool seasons with ample rainfall produced durum wheats of relatively better color than did hot dry seasons.

Inspection of agricultural seeds, H. R. KRAYBILL ET AL. (*Indiana Sta. Circ. 192 (1932), pp. 12, fig. 1*).—The average percentages of germination, purity, and weed seed content, and for legumes the hard seed content, are tabulated from tests of 1,177 official samples of seed collected from dealers in Indiana during the year ended June 30, 1932.

Agricultural seed, A. S. LUTMAN (*Vermont Sta. Bul. 347 (1932), pp. 24*).—Tables show the purity and germination guaranties and significant variations

therefrom for 380 samples of agricultural seed collected from dealers in Vermont during 1932. Observations are made concerning the seed law, seed purchase and usage, and seed growing.

The Seeds Act, with amendments and regulations (*Ottawa: Canada Dept. Agr., Seed Branch, 1932, pp. 54*).—The text of the Canadian law (E. S. R., 53, p. 238) and amendments, governing the testing, inspection, and sale of seeds is set forth with regulations approved in October, 1932, and the personnel of the advisory board provided for.

Killing perennial weeds with chlorates during winter, W. C. MUENSCHER (*New York Cornell Sta. Bul. 542 (1932), pp. 8, fig. 1*).—The application of sodium chlorate in late autumn, November 3 to 20, before the ground froze, at the rate of 200 to 600 lbs. per acre of dry salt spread over the surface of the soil effectively controlled the deep-rooted perennials Canada thistle (confirming results of Åslander (E. S. R., 60, p. 41)), chicory, leafy spurge, bindweed, perennial sow thistle, and quack grass, and also the shallow-rooted perennials speedwell, orange hawkweed, mouse-ear chickweed, heal-all, and ground-ivy. This method of applying the chlorate has several advantages over the spray method, although it is considered too expensive at current prices to be employed generally on large areas.

HORTICULTURE

[Horticulture at the Arkansas Station], J. R. COOPER, C. B. WIGGANS, V. M. WATTS, G. JANSSEN, and R. P. BARTHOLOMEW (*Arkansas Sta. Bul. 280 (1932), pp. 46–51, 52, 53*).—The results are presented of studies on the relation of chemical composition of apple buds, length of spurs, etc., to fruit bud differentiation; on the causes of self-unfruitfulness of the Stayman Winesap and on the nature of fruit dropping; on the relation of style length of the tomato to fruitfulness; on the function of soil moisture, soil nitrates, and shade in the fruiting of *Lilium longiflorum;* on studies of the metabolism of herbaceous plants; on the effects of air temperature and nutrient deficiencies on the growth and fruiting of tomatoes; on the effects of pruning on the growth and fruiting of apples; on the effect of staking tomatoes on yields; on fertilizer studies with fruits and vegetables; and on variety tests of vegetables.

[Horticulture at the Colorado Station], E. P. SANDSTEN (*Colorado Sta. Rpt. 1932, pp. 48–50, 51–53*).—Results are briefly noted on varietal and strain studies with garden peas; the growing of vinifera grapes; strawberry varieties; and Spanish onion breeding.

[Horticulture at the Oklahoma Station], J. E. WEBSTER, G. W. COCHRAN, D. V. SHUHART, F. B. CROSS, and E. F. BURK (*Oklahoma Sta. [Bien.] Rpt. 1931–32, pp. 186, 187, 217–235, 236–239, 240, 241, 242, 243, figs. 2*).—In this general progress report information is presented on variety, germination, and propagation studies with the pecan; on the causes of dropping and the translocation of carbohydrate materials in the pecan; on variety, pruning, and chemical studies with grapes; on factors such as day length, fertilizers, and rootstocks that may be concerned in the uneven ripening of Concord grapes; on the time of fruit bud differentiation in the Concord and Extra grapes; on general varietal trials with various tree and small fruits; on the effect of oil sprays on the transpiration of apple and grape leaves; on the effects of fertilizer on the handling qualities of strawberries and tomatoes; on the relation between chemical composition of tomatoes and strawberries and their shipping quality; on fertilizer tests with cabbage; on varietal tests of tomatoes, radishes, and other vegetables; and on the use of synthetic manures for heating plant beds.

Contributions from the Wisley Laboratory, LXII, LXIII, M. A. H. TINCKER (*Jour. Roy. Hort. Soc., 57 (1932), No. 2, pp. 321–331, pls. 6*).—Two studies at the Wisley Laboratory are here reported.

LXII. *Response of some common garden plants to the daily period of light* (pp. 321–325).—*Sedum spectabile, Saxifraga decipiens*, the Pride of Dover Anchusa, and William Pitt tulip plants exposed to different length photoperiods ranging from 6 to 12 hours of daylight plus several hours of weak artificial light bloomed with the longer light period and developed vegetatively with the shorter periods. Weighings made of tulip bulbs after the leaves had died showed average weights of 5.25, 6.5, and 6.95 g for the 6-, 12-, and 18-hour light periods.

LXIII. *The influence of the daily period of light and the supply of potassium on the rate of growth of tubers and other storage organs* (pp. 326–331).—The results of experiments in which *Phaseolus multiflorus*, dahlia, and *Stachys tuberifera* plants were grown under different photoperiods with and without a supply of potassium indicated that potassium is necessary for the maximum development of the plant. However, since tubers and swollen roots were produced in the absence of sufficient potassium, it was apparent that the stems and leaves gave up their supply of potassium to the roots. The length of the photoperiod determined largely the use to which the plant applied its manufactured by-products. Without adequate potassium, leaves failed to attain their maximum efficiency as carbohydrate manufacturers. The indications were also that potassium was associated with the building up of protein compounds in the plant.

[Vegetables at the Illinois Station] (*Illinois Sta. Rpt. 1932, pp. 210–223, fig. 1*).—Progress reports are made by J. W. Lloyd E. P. Lewis, C. C. Compton, L. H. Shropshire, W. A. Huelsen, W. H. Michaels, and H. M. Newell on the results of fertilizer and cover crop studies with cabbage, sweet corn, cucumbers, onions, and other vegetables; on the time of cutting asparagus; on the improvement in color of Detroit Dark Red beets; on variations within vegetable varieties; on the benefits of spraying vegetables; on sweet corn improvement by line breeding and recombination; on sweet corn fertilization; on the development of wilt-resistant tomatoes; on the use of fertilizers for greenhouse tomatoes; and on the proper loading of cars to reduce transportation losses.

[Vegetable crops at the New York State Station] (*New York State Sta. Rpt. 1932, pp. 42, 91, 92, 101–103, 104, 105*).—Among various activities for which data are briefly reported are effect of hot water treatment on cabbage seed; vitality of seed stocks apparently injured by prolonged drought; rotation and fertilizer trials with tomatoes, cabbage, and peas; tests of pea varieties; studies of the effects of fertilizer on the quality of peas; and studies of sweet corn and cucumber varieties.

The vegetable industry of New York State (*N. Y. State Dept. Agr. and Markets, Agr. Bul. 240 (1930), pp. 341, figs. 135*).—Included in this compilation of general information, largely prepared by successful growers, are the following semitechnical papers: Market Gardening in the Empire State, by P. Work (pp. 86–88); Vegetable Research for New York State, by P. Work and H. C. Thompson (pp. 111–113); Growing Vegetables on Muck Lands, by H. C. Thompson (pp. 138–143); Soils and Fertilizers for Vegetables (pp. 13–23) and Muck Soils of New York (pp. 129–137), both by R. C. Collison; and Growing Vegetables for the Canning Industry, by C. B. Sayre (pp. 118–128). The contributions on economic insects have been noted (E. S. R., 67, p. 424).

Weed seeds found in vegetable seeds, O. M. HOEFLE (*New York State Sta. Bul. 616 (1932), pp. 15*).—Of 3,828 samples collected over a period of nine years, 43.9 per cent were found to contain impurities of one kind or another. Among

the 165 different weed seed species and other crop seeds found were all the weeds listed in the New York seed law as noxious species. Practically all the weeds listed as troublesome in the garden occurred with more or less frequency in these samples. Carrots were most frequently contaminated, 92.6 per cent of the samples carrying weed seeds or foreign matter, followed in descending order of frequency of contamination by endive, parsley, celery, lettuce, spinach, parsnip, radish, turnip, and rutabaga.

Careless or possibly unavoidable practices of growing, harvesting, and cleaning seed crops, together with later unavoidable or intentional contamination, as well as repacketing processes, appeared to be largely responsible for the contamination observed.

Analyses of materials sold as insecticides and fungicides during 1932, C. S. CATHCART and R. L. WILLIS (*New Jersey Stas. Bul. 548 (1932), pp. 15*).—The results are presented of analyses of various insecticides and fungicides collected during the inspection of 1932 (E. S. R., 67, p. 36).

[Pomology at the Illinois Station] (*Illinois Sta. Rpt. 1932, pp. 189–194, 200, 201, 202, 204–207, 208–210*).—Among items considered in this report by J. C. Blair, J. S. Whitmire, R. L. McMunn, V. W. Kelley, W. A. Ruth, M. J. Dorsey, R. S. Marsh, H. W. Anderson, J. W. Lloyd, H. M. Newell, and A. S. Colby are the breeding of new apples and peaches; the testing of apple varieties; the training of young apple trees; the residual effect of apple fertilizers; soil management, fertilization, and pruning of apple orchards; soil management, fertilization, and thinning of peaches; the nature of winter injury to apple and peach trees; sour cherry pruning; the use of hardy stocks for cherries; means of reducing costs of fruit harvesting; variety testing of small fruits and nuts; grape pruning; and gooseberry improvement.

[Pomology at the New York State Station] (*New York State Sta. Rpt. 1932, pp. 47, 48, 75–89, 90, 91, 92–100*).—Brief notes are made as to the results of studies of the relation of chemical composition and quality in canning peas; the effects of root rot on the growth and composition of peas; the coloring of McIntosh apples with artificial light; fruit breeding activities; the dissemination of named seedlings; bud selection in the Rome Beauty apple; color mutations in apples and grapes; pollination experiments with cherries; variety tests of fruits; orchard fertilizer tests and soil management studies; chromosomal constitution of apple and cherry seedlings; metaxenia in apples; the anatomy of the chromosome; varieties of fruit of use as parents for seedling rootstocks; embryogeny of early and late varieties of sweet cherries; artificial culture of abortive cherry embryos; production of nursery stock, including protective coverings; asexual propagation of fruit trees; composition of rose cuttings; growth of apple and pear on different rootstocks; and stock and scion relationships.

Survey of residual phosphorus in orchard soils, J. H. GOURLEY (*Ohio State Hort. Soc. Proc., 65 (1932), pp. 28–32*).—Measurements by the Truog colorimetric test of soluble phosphorus in different soil horizons in 25 Ohio orchards showed very slight penetration of phosphorus, except in deeply tilled soils. Phosphorus applied as superphosphate was apparently quickly fixed, suggesting that in sod orchards only the surface roots contact the material.

Factors affecting the use of nitrate and ammonium nitrogen by apple trees, V. A. TIEDJENS and M. A. BLAKE (*New Jersey Stas. Bul. 547 (1932), pp. 32, figs. 5*).—That the apple tree is able to absorb and assimilate ammonium nitrogen without oxidation to nitrates was indicated in a series of studies in which Delicious trees, part commercial stock and part selected buds on clonal roots, were grown in sand cultures supplied with nutrient solutions, the nitrogen

of which was obtained from different sources and in which the H-ion concentration was maintained as nearly as possible at several different levels.

Ammonium assimilation progressed most rapidly in the pH range of 6 and above; in fact the greatest elaboration of nitrogenous fractions in the ammonium-supplied trees occurred at pH 6.5 but the greatest volume of growth was made at pH 7.5. In the sodium nitrate trees the greatest elaboration of total nitrogen and also the greatest volume of growth took place at pH 5.5 and 6.5. Under favorable pH conditions ammonium produced a more rapid growth than did nitrate.

The relatively more rapid assimilation of ammonium than of nitrate was particularly manifest in the highly soluble fractions of organic nitrogen and in the comparatively low concentrations of sugars and starch in the ammonium-treated trees. Much higher concentrations of nitrate than of ammonium were needed to obtain equal increases in organic nitrogen and growth. Nitrate assimilation depended apparently on reducase activity, whereas ammonium was utilized directly. The assimilation of both forms of nitrogen apparently took place largely in the fine fibrous roots. The greatest volume of growth occurred in trees whose ratio of protein to soluble nitrogen was comparatively high.

No material differences were noted between trees on seedling roots and those on clonal roots.

Root studies of young apple trees, J. Oskamp (*Gartenbauwissenschaft, 7 (1932), No. 1, pp. 7–14, figs. 4*).—In this study, conducted by the Indiana Experiment Station, Grimes Golden apple trees growing under different soil management treatments, namely, clean cultivation, straw mulch, grass sod, and grass mulch, were dug toward the end of their fourth year in the orchard and a careful study made of the lateral and vertical distribution of the roots. The greatest lateral spread was 16 ft. in the case of both cultivated and straw-mulched trees. At this early date mulching had not caused an increase of surface roots, but there appeared to be more fibrous roots in proportion to total weight in the case of the sod-grown trees. Under all treatments the majority of the roots were in the upper 18 in., with a few straggling roots penetrating to a maximum depth of 3 ft. The soil in question was 70 per cent silt, 16 per cent clay, and 14 per cent sand.

Experimental results in the pruning of bearing trees, W. A. Ruth (*Ohio State Hort. Soc. Proc., 65 (1932), pp. 59–62*).—From results obtained at the Illinois Experiment Station the author concludes that pruning of Grimes apple trees maintains fruit size without reducing total yields. In Jonathan, on the other hand, the better color obtained by pruning was offset by a material reduction in commercially valuable medium sizes. Alternation in yield was not induced nor was production increased, but evidence was obtained that varieties should be pruned differently.

Some pertinent points in fruit setting and fruit thinning, F. S. Howlett (*Ohio State Hort. Soc. Proc., 65 (1932), pp. 33–43*).—On the basis of studies at the Ohio Experiment Station the author arranges important apple varieties in two groups, namely, those susceptible to unfavorable conditions during the fruit setting period and those more dependable under the same environment. In the heavy crop years of 1929 and 1931 thinning Jonathan apples increased the percentage of large sizes and improved color slightly, but decreased the total yield of marketable fruit so that in 1931 there was a distinct monetary loss from thinning. On the other hand, thinning Grimes Golden during the heavy crop year of 1930 resulted in very definite profits. Because of variation in size of leaves due to thinning treatments the author believes that leaf number is not as good an index as intervening space in thinning fruits.

Early-maturing varieties, such as Wealthy, Yellow Transparent, Oldenburg, and Red June, were thinned before the June drop with favorable results. Some indication was obtained with varieties such as Jonathan, which do not tend to fruit in clusters, that pruning would be an economical means of increasing the size and color of apples.

Thinning vs. tree vigor for peach size, A. J. Olney (*Ky. State Hort. Soc. Trans., (1931), pp. 50–56*).—At the Kentucky Experiment Station 45 6-year-old Elberta peach trees were thinned at various times during the 6 weeks following the June drop, with no great difference in size of remaining fruits, suggesting that there is a considerable period in which thinning may be done satisfactorily. Measurements of shoots of the thinned trees showed the longest growth on those trees producing the largest average size of fruits.

Pruning experiment with peach trees [trans. title], H. Niitsu and M. Ohsaki (*Jour. Okitsu Hort. Soc., No. 27 (1931), pp. 171–218, pls. 10; Eng. abs., pp. 215, 216*).—In comparisons at the Imperial Horticultural Experiment Station, Okitsu, Japan, peach trees headed at 30 and 60 cm at the time of planting and thereafter pruned in different ways showed in all cases that the shorter-trunked trees were the more vigorous and fruitful. Growth and yield were more or less proportional to the severity of pruning in the 30-cm trees, but in the 60-cm group there was no significant difference according to the severity of the pruning.

A study of the structure of the skin and pubescence of the peach in relation to brushing, M. J. Dorsey and J. S. Potter (*Illinois Sta. Bul. 385 (1932), pp. 405–424, figs. 6*).—Histological studies made of peaches at various stages of development showed that at first only the epidermal layer protects the young peach but that as growth proceeds the deeper layers assist in the protective function. At maturity the epidermal cells appeared to function chiefly as buffer units, having lost their earlier tensile strength. The peach hair was found to be an outgrowth of a single epidermal cell. In Elberta, hairs continued to form until about three weeks after blooming. In brushing or handling peaches the hairs broke off at the surface, the weakest point in their structure. Brushing removed a much larger proportion of the longer hairs than of the shorter ones.

Indications were observed that brushed peaches were somewhat more susceptible to brown rot, but in the absence of serious infection brushing was worth while because of a cleaner and more attractive pack. Brushing is deemed a safe practice in so far as direct injury to the fruit is concerned. It is considered probable that disease spores can make a much more direct contact with brushed peach surfaces than with the unbrushed.

Fruitfulness in plums [trans. title], A. Morettini (*Italia Agr., 69 (1932), No. 11, pp. 961–983, figs. 15*).—Using a 15 per cent sugar solution, pollen germination tests conducted at the Royal School of Agriculture, Firenze (Florence), Italy, showed the lowest percentage of growth (15 per cent) in Shiro and the maximum (95 per cent) in Myrobalan, Imperial Epineuse, and German Prune. Burbank proved self-sterile but was satisfactorily pollinated by Myrobalan, Santa Rosa, Shiro, Sultan, and *Prunus pissardi*. For the partially self-sterile Santa Rosa, Myrobalan, Burbank, and Shiro proved good pollinizers. Shiro, as self-sterile as Burbank, was effectively pollinated by Santa Rosa, Burbank, and Myrobalan. The following plums were self-sterile: America, Bon-Bon, Botan, Combination, Imperial Epineuse, Heron, Ogden, Oberdan, Red June, Wickson, and Satsuma. In varying degrees the following were self-fruitful: Chalco, Giant, Agen, Caterina, Minot, Letricourt, German, Italian, and Friulana.

The determination of maturity in fruits [trans. title], M. Muccini (*R. Staz. Chim. Agr. Torino Ann., 11 (1929–1931), pp. 249–277, fig. 1*).—Discussing the pressure tester with respect to origin, development, and mechanical make-up, the author presents the results of tests with apples, pears, plums, and apricots.

The effects of various manurial treatments on the chemical composition of strawberries, L. D. M. Knight and T. Wallace (*Jour. Pomol. and Hort. Sci., 10 (1932), No. 3, pp. 147–180, figs. 2*).—At the Long Ashton Research Station, England, Royal Sovereign strawberry plants grown during an abnormally wet season which resulted in strong vegetative growth responded markedly to differential fertilizer treatments. For example, plants receiving no potash were below the remainder in vigor, in yield, and in size of fruit. Plants treated with both stable manure and inorganic fertilizers yielded the largest berries.

As determined by chemical analysis, the nitrogen content of the fruit of all treatments decreased during the picking period and was highest in fruits from plats receiving inorganic manures. There was a negative correlation between nitrogen content and acidity and between nitrogen and total sugars. Acid content of berries was lowest in the plats receiving no potash. In general, acid content varied unevenly with a tendency to decrease with the advancing season. Total sugars and sucrose showed a gradual increase, and reducing sugars varied irregularly. Calcium contents were relatively low in the first and second pickings and much higher in the third and fourth.

The Narcissa strawberry, G. M. Darrow, G. F. Waldo, and W. S. Brown (*Oregon Sta. Circ. Inform. 79 (1932), pp. 2*).—Prepared in mimeographed form, this circular presents information upon the origin, characteristics, and behavior of the Narcissa strawberry, a new variety resulting from a cross of Royal Sovereign × Howard 17 made in 1923 at the U. S. Plant Field Station, Glenn Dale, Md.

The oxygen content of water in winter-flooded bogs under ice, H. F. Bergman (*Wis. State Cranberry Growers' Assoc.* [*Proc.*], *44 (1930), pp. 32–40*).—In the belief that dropping of leaves of cranberry vines on certain bogs that had been under ice during the winter was the result of oxygen shortage, determinations were made of the oxygen content of the water under ice in two winter-flooded Massachusetts bogs. The results showed an oxygen deficiency in such waters during a considerable part of the winter flooding period.

Indicator methods for the determination of the oxygen content of water, H. F. Bergman (*Wis. State Cranberry Growers' Assoc.* [*Proc.*], *44 (1930), pp. 40–46*).—Submergence of cranberry vines for from 1 to 2 hours in water at from 23 to 25° C. caused only slight injury to flower buds and none at all to flowers and growing tips, even with an oxygen content of 1 ml or less per liter. Lowering the temperature to 20° permitted longer submergence with no increased injury. Perch and sunfish exhibited difficulty in breathing by the time the oxygen had decreased to 2 ml per liter, and were therefor valuable as indicators of oxygen shortage. A colorimetric method in which a phenolic compound which absorbs oxygen becomes colored only in an alkaline medium such as sodium carbonate was found very simple and effective.

Fig culture in the Gulf coast region of Texas, R. H. Stansel and R. H. Wyche (*Texas Sta. Bul. 466 (1932), pp. 28, figs. 14*).—A general discussion of fig growing in which are incorporated the results of various experiments. Variety trials at Angleton showed Celeste, Green Ischia, Magnolia, and Brown Turkey to withstand winter temperatures as low as 11° F. Green Ischia, Magnolia, and Brunswick were the highest producers. At Beaumont, Brunswick was the highest yielding fig, followed in order by Magnolia, Kadota, Celeste, etc.

Measurements of the roots of a 6-year-old Magnolia fig tree showed a maximum spread of 35.6 ft. from the trunk. In general the roots lay near the surface, necessitating a shallow culture. In fertilizer tests all materials applied, except sulfur, appeared beneficial. The increase from lime was, however, insignificant.

A comparison of five degrees of pruning, ranging from a light thinning to a severe treatment, showed an inverse correlation between severity of the pruning and yield. The importance of sanitation measures for the control of insects is stressed. Fig rust, the most prevalent and serious plant disease, was effectively controlled by four or five applications of Bordeaux mixture, 5-5-50.

A vine uniformity trial, A. G. Strickland, H. C. Forster, and A. J. Vasey (*Jour. Dept. Agr. Victoria, 30 (1932), No. 12, pp. 584–593, figs. 3*).—Records taken at the Viticultural Station, Rutherglen, Victoria, on Shiraz grapevines at least 24 years old showed a wide variation in the yield per vine, ranging from 1.5 to 16.5 lbs., the variability being due apparently to inherent differences in the vines and to the environment. The coefficient of variability for all the vines was found to be 33.4 per cent. With an estimated plat size of eight plants, it was estimated that four replications would be needed to show differences between treatments of the order of 20 per cent and nine replications of the order of 10 per cent.

The breeding of Plasmopara-resistant grapes [trans. title], B. Husfeld (*Gartenbauwissenschaft, 7 (1932), No. 1, pp. 15–92, figs. 57*).—In studies at the Kaiser Wilhelm Institute, Müncheberg, and at the University of Giessen, no distinct biological strains of Plasmopara were discovered. There were found 38 diploid chromosomes in both European and American grapes, and in species crosses no chromosomal disturbances were observed beyond the F_2 generation. Two selfed seedlings were found with 40 diploid chromosomes. Resistance to Plasmopara appeared to lie in a rapid death of the attacked cells and tissues and a stimulated production of chlorophyll or anthocyans in the surrounding cells. Plasmopara mycelium was strikingly weaker in resistant than in susceptible leaves. In conclusion the author points out that the only hope of securing high quality mildew-resistant grapes is in the production of very large filial generations.

The storage of table grapes [trans. title], E. Bottini (*R. Staz. Chim. Agr. Torino Ann., 11 (1929–1931), pp. 307–331, figs. 2*).—At a temperature of 1 to 2° C. table grapes held in good condition for only about 1 month. After this time the berries began to shrivel or became moldy. The provision of a water supply to the stem, sacking in cellophane bags, or layering in cork sawdust failed to give satisfactory results. Among the best keeping varieties were Darkaia nera, Lagrima di Maria, Marsigliana, Ohanez, Pergolese, and Razaki Rosso, probably because of their solid flesh and relatively low water content. The force required to separate berries from stem was not found a reliable index to keeping quality because of variability during the keeping period. In Chasselas doré, Chasselas rosé de Negrepont, and Besgano there was some increase in reducing sugars and a decline in acids during storage.

Report on pecan fertilizer experiments being conducted by the Florida Agricultural Experiment Station, G. H. Blackmon and R. W. Ruprecht (*Ga.-Fla. Pecan Growers Assoc. Proc., 1932, pp. 14–23*).—Data presented on the results of fertilizer experiments with pecans at different points in Florida show in all except two cases increased yields as a result of fertilization, and suggest that with the use of a properly balanced fertilizer it is possible to materially increase production per acre. No marked differences were noted in the percentage of kernel content as the result of fertilizers.

Two years' results of pruning bearing pecan trees, H. L. Crane (*Ga.-Fla. Pecan Growers Assoc. Proc., 1932, pp. 44–51*).—In this study, conducted by the U. S. Department of Agriculture near Albany, Ga., pruning in all cases stimulated the growth of trees and materially increased the size of individual nuts, but had no influence on total production. The higher price received for large nuts in many cases paid for the pruning and returned a fair profit to the grower. The application of nitrogen to pruned and unpruned trees did not increase the percentage of larger nuts. Nuts produced on pruned trees were in general slightly better filled than were those on similar unpruned trees. Pruning facilitated successful spraying.

Breeding walnuts, R. Wellington (*North. Nut Growers Assoc. Proc., 22 (1931), pp. 15–21*).—A brief account is given of a cross made at the New York State Experiment Station in 1909 between *Juglans nigra* and *J. regia* from which resulted 12 hybrids, all of which, though extremely vigorous in most cases, showed a lack in productiveness.

[Floriculture at the Illinois Station] (*Illinois Sta. Rpt. 1932, pp. 223–226, figs. 3*).—Information is presented by F. F. Weinard, S. W. Decker, and H. B. Dorner on the result of photoperiod and temperature studies with the gladiolus; on the effect of steaming soil on carnation production; on the classification of peony varieties; and on the use of fertilizer for the peony.

Effect of storage temperature on date of flowering in the Paperwhite narcissus, D. Griffiths and R. C. Wright (*Jour. Heredity, 23 (1932), No. 11, pp. 467–470, figs. 2*).—Florida-grown bulbs stored at 55° F. for 6 weeks before potting the latter part of September flowered about 2 weeks earlier than did the control bulbs. The number and size of florets were decreased considerably, but at 55° not to the point to render the treatment impracticable where early flowers are desired. A temperature of 36° during the same period delayed flowering about 2 weeks as compared with the check but did not reduce the number of florets. Apparently a period of relatively high temperature, 70° or more, is needed to bring about normal flowering in the Paperwhite narcissus.

FORESTRY

[Forestry at the Arkansas Station], L. M. Turner (*Arkansas Sta. Bul. 280 (1932), p. 54*).—Brief comments are presented on the successful growth of black locust on strongly acid soils; on the beneficial effects of supplemental water on germination and growth of coniferous seedlings; and on timber sales from submarginal farms.

Ohio Forest News, [November, 1932] (*Ohio Forest News [Ohio Sta.], No. 20 (1932), pp. 8, figs. 2*).—Brief notes are presented on various items of forestry interest, including the westward spread of the gipsy moth, the Macedonian pine, the black walnut, and conifer species tests at Wooster.

Hastening germination of basswood seeds, J. N. Spaeth (*Jour. Forestry, 30 (1932), No. 8, pp. 925–928*).—Stating that under natural conditions the germination of basswood seed is delayed several years, the author reports the successful results of experiments at Cornell University in which seeds after extraction from the nutlike fruit were treated for 12 minutes with concentrated sulfuric acid, washed in water, and then placed in refrigeration in a moist, sterile medium providing good aeration. Scarified seeds were more subject to decay than were those treated with the acid.

Studies on tree roots, E. V. Laing ([*Gt. Brit.*] *Forestry Comn. Bul. 13 (1932), pp. 73, pls. 17, figs. 8*).—In neither peat nor mineral soils did the presence of mycorrhiza-forming fungi necessarily mean the presence of mycorrhiza on the roots. Mycorrhiza formation was in many cases stimulated by manures

and was greater on the more vigorous trees. Mycorrhiza were formed only in those peats in which there was aeration, and the addition of certain oxidizing substances increased mycorrhiza formation. The most successful tree growth was observed to occur when there was an equal proportion of fungus and ordinary roots present.

Studies of rooting habits of conifers growing in peat soils showed that surface rooting is characteristic. Metabolism on such soils is often imperfect, with the production of toxic substances, such as oxalic acid, which in turn may be neutralized by the calcium already existing in the plant. Calcium deficiency led to the nonconversion of starch into sugar. The addition of calcium in the form of basic slag and also magnesium favored growth. In water cultures the root systems of *Picea excelsa* and *P. sitchensis* showed distinct injury in the absence of iron. Abnormal color of needles occurred most noticeably in the absence of magnesium, nitrogen, and iron. With both species under all treatments fats were found in the leaves, except where potash was omitted from the culture.

No appreciable root growth occurred during winter in conifers in the nursery, and in the spring shoot growth commenced before root growth, with an interplay of the two throughout the growing season. Periodicity was observed in starch accumulation in the leaves.

Studies in forest ecology, I, II, R. C. Friesner and J. E. Potzger (*Butler Univ. Bot. Studies, 2 (1932), Papers 11–13, pp. 133–144, figs. 4; 145–149*).—This contribution from Butler University is presented in two parts. The first of these, entitled Factors Concerned in Hemlock Reproduction in Indiana, points out that hemlock reproduction is apparently inhibited on plateaus and more gentle slopes by the deep floor covering of litter. Hence hemlock was found growing under the more rigorous conditions of low moisture, wide temperature fluctuations, and rapid evaporation, being more tolerant to these adverse conditions than were the hardwoods.

The second part, The Ecological Significance of *Tsuga canadensis* in Indiana, presents the conclusions that hemlock in Indiana is a relict of a former hemlock climatic climax and is not codominant with beech and maple, the species with which it is commonly associated.

Is the longleaf type a climax? H. H. Chapman (*Ecology, 13 (1932), No. 4, pp. 328–334*).—At Urania, La., on plats established by the Yale University School of Forestry in 1917, it was observed that wherever oaks or species of pine other than the longleaf germinated or sprouted in the same year as the longleaf pine these species in the absence of further fires in every case suppressed longleaf pine, hindered its height growth, and ultimately caused its death after about 15 years. Furthermore, on land protected from fire, new longleaf seedlings appeared in steadily decreasing numbers with subsequent seasons and practically never appeared in the unburned dense litter of dead bunch grass or wire grass. In addition, on fire excluded areas a virulent needle blight (*Septoria acicola*) attacked and defoliated the small longleaf pines, apparently being favored by the relatively high moisture existing near the grass zone.

The successional trend and its relation to second-growth forests in southeastern Alaska, R. F. Taylor (*Ecology, 13 (1932), No. 4, pp. 381–391, figs. 4*).—Following cutting, Alaska forests were observed to contain almost double the percentage of Sitka spruce existing in the original forest. Since this accretion resulted in an increased volume of wood per acre, a study was initiated of the factors concerned in the reproduction and growth of this species.

Apparently any condition in the virgin forest which exposed the mineral soil or favored hardwoods and other vegetation characteristic of glacial soils also favored the reproduction and growth of Sitka spruce. Observations on the ground cover indicated that spruce reproduces best on the less acid soils, and this fact is believed to account in part for the somewhat slow reestablishment of the spruce on cut-over areas. The ground cover indicating conditions most favorable for Sitka spruce was the circumneutral Alnus-Salix-Populus type. The least promising sites were indicated by a growth of healthy shrubs, ferns, etc.

A mixture of the two principal species, spruce and hemlock, gave better results than did pure stands of either.

Determination of the errors of estimate of a forest survey, with special reference to the bottom-land hardwood forest region, F. X. Schumacher and H. Bull (*Jour. Agr. Res.* [*U. S.*], *45* (*1932*), *No. 12, pp. 741–756, fig. 1*).—Analyses of the data obtained in a preliminary sample survey of two parishes in northeastern Louisiana containing an approximate total of 503,000 acres, of which some 63 per cent was in forest, suggested the advisability of having the survey lines 10 miles apart and the quarter-acre sample plats within the forest at 660-ft. intervals along the lines. If the standard error was to be kept to a practicable minimum the land area analyses revealed that the number of plats in the various land classes, while correctly establishing their proportional areas, could not be considered as random samples of the land classes. Using unit lengths of 0.5, 3, and 24 miles, it was found that the error of estimate in the linear measurement method of area by land classification increased with unit lengths longer than 0.5 mile. The actual errors of the linear measurement method were found to agree with the estimated errors. In volume analyses the standard error of estimate of total volume was found slightly more than 4 per cent of the total volume.

The structure and strength of four North American woods as influenced by range, habitat, and position in the tree, J. E. Myer (*N. Y. State Col. Forestry, Syracuse Univ., Tech. Pub. 31* (*1930*), *pp. 39*).—This paper presents a study of the anatomical variations in the wood structure of four timber species, namely, eastern white pine, eastern hemlock, sugar maple, and white oak, and correlates the geographical distribution of the trees with variations in the structure and strength of the wood. The habitat factor was excluded except in the case of hemlock where material was collected from two different timber types in the Adirondacks.

It was found that the texture and strength of the wood of white pine, eastern hemlock, sugar maple, and white oak give scant evidence of being influenced by range, but quite definite relationships seem to hold with regard to position within the tree. Position in the tree does not appreciably affect the strength of pine wood, the wood at the butt being but slightly weaker than that at the 16-ft. level. The strength values for hemlock hold quite constant for the first 16 ft. and then decrease toward the top. Hemlock from the slope and spruce flat types gave no consistent differences in strength values.

In sugar maple there is no consistent relationship between range, texture, and strength. Position in the tree on the other hand appreciably influences texture and strength in compression. The compression strength parallel to the grain increases slightly in maple from the butt to the 16-ft. level, above which it remains fairly constant.

Lengthwise in the tree the texture of white oak wood remains quite constant, while density decreases from the butt to the top of the merchantable part. The compression strength parallel to the grain reaches its maximum at the 16-ft. level on the bole and decreases toward both extremities.

DISEASES OF PLANTS

The scientific principles of plant protection, H. MARTIN (*London: Edward Arnold & Co., 1928, pp. XII+316*).—"The primary object of this book is to assist cooperation by a comprehensive survey of the scientific principles underlying modern methods of control of crop pests, and so to present to the mycologist and entomologist a view of the chemical and physical aspects and similarly to the chemist and physicist a means of approach to the biological side. . . . A second has been to provide for the teacher and student of agricultural chemistry a book of reference upon insecticides and fungicides. . . . It has been found necessary, however, to confine the subject solely to the principles of the control measures employed against parasitic diseases and pests detrimental to crop production."

Plant pathology (*Arkansas Sta. Bul. 280 (1932), pp. 54–58*).—Progress reports are given of investigations on cotton wilt, by V. H. Young, J. O. Ware, and G. Janssen; etiology and control of seedling blights and boll rots of cotton and grape spraying experiments, by Young; control of oat smut, by Young and C. K. McClelland; seedling blight and stem rot of rice, by E. M. Cralley; straight head of rice, by E. C. Tullis, L. C. Kapp, and Cralley; and fire blight of apples and pears and etiology of tip and margin burning of potatoes, by H. R. Rosen.

Report of the botanist, L. W. DURRELL (*Colorado Sta. Rpt. 1932, pp. 27, 28*).—A report is given of investigations by E. J. Starkey on carnation root rot and the dying of cucumbers following excessive use of nitrate of soda, and by E. W. Bodine on spraying for purple blotch of onions and *Macrosporium solani* as the causal organism in collar rot of tomatoes.

[Plant disease investigations at the Illinois Station] (*Illinois Sta. Rpt. 1932, pp. 53–55, 195–200, 202–204, 210, 227, figs. 4*).—Notes are given of investigations by B. Koehler on moisture limits for corn rot fungi; by Koehler and J. R. Holbert on seed corn treatment; by H. W. Anderson on flotation sulfur for apple scab control; by V. W. Kelley and M. D. Farrar on the effect of sprays of high oil concentration on delaying bud development; by Anderson on apple measles, on the poor quality of oriental blight-resistant pears, on the use of zinc sulfate-lime and lead arsenate on peaches for the control of bacterial leaf spot, and on new data on the bacterial leaf spot; by Anderson, K. J. Kadow, and A. S. Colby on soil conditions as related to strawberry root rot; and by F. F. Weinard and C. C. Compton on a survey of diseases of greenhouse plants.

[Plant pathology studies at the New York State Station] (*New York State Sta. Rpt. 1932, pp. 31–40, 43, 46*).—Notes are given on the progress of studies with hard-shell of beans, raspberry mosaic, a mosaic-like strawberry disease, pea root rot, the use of cuprous oxide for the control of damping-off of tomatoes, mosaic in Refugee beans, the injury caused by sulfur fungicides, the use of lime-sulfur for the control of apple scab, the comparative adhesiveness of wettable sulfur and lime-sulfur sprays, control of potato aphids by the parasitic fungus *Empusa* sp., nematode root knot of potatoes, and loose smut in barley and wheat (including the finding of two spore forms of *Ustilago nuda*.)

Plant disease studies, F. M. ROLFS (*Oklahoma Sta. [Bien.] Rpt. 1931–32, pp. 280–286*).—Observations are reported on bacterial leaf spot of cotton and apple blotch and their control.

Fusarium [trans. title], H. W. WOLLENWEBER (*Ztschr. Wiss. Biol., Abt. F, Ztschr. Parasitenk., 3 (1931), No. 3, pp. 269–516, figs. 71.*)—This monograph on the genus Fusarium includes both parasitic and saprophytic forms.

Notes on the "bukuryô," sclerotia of Pachyma hoelen Rumph., I. Hino and H. Katô (*Bul. Miyazaki Col. Agr. and Forestry, No. 2 (1930), pp. 77–91, pls. 3*).—"The authors present in this paper their observations on the bukuryô, which may be a sclerotium formed by *P. hoelen* Rumph. The bukuryô is probably identical with the tuckahoe, to which *P. cocos*, Fr. or *Poria cocos* (Fr.) Wolf is applied." This fungus is thought to be weakly parasitic, causing a white rot of the roots of the host, said to be usually pine in the prime of growth, particularly *Pinus thunbergii*, but also *P. densiflora*, mulberry, and supposedly other hosts.

The irregular globose cells found interiorly are considered by the authors to have been transformed from the normal vegetative mycelia and not from the woody cells of the host.

Some chemical and physiological studies on the nature and transmission of "infectious chlorosis" in variegated plants, E. F. Davis (*Ann. Missouri Bot. Gard., 16 (1929), No. 2, pp. 145–226, pls. 7, figs. 6*).—The author was not able to confirm, in the case of *Euonymus japonicus aureus*, the observations of Baur (E. S. R., 18, p. 648) with reference to the effects which the quality of light had upon certain plants infected with chlorosis.

Continuous illumination for two months under controlled conditions with intensity near that of sunlight failed to alter materially or permanently the typical variegated appearance of *Abutilon thompsonii, E. japonicus aureus*, or *E. japonicus mediopictus*. *A. thompsonii* plants receiving short exposures to artificial light under controlled conditions developed new leaves which became successfully more uniformly green, and toward the close of the experiments new leaves were maturing without any markedly chlorotic character.

Plants of *A. thompsonii* kept in darkness for a few days to two weeks lost all of their leaves. The new leaves developed in darkness showed no variegation even when matured in the light, though leaves developed after the plants were restored to the light showed the variegation.

Studies of *A. thompsonii* made upon fixed and stained sections of areas transitional between green and chlorotic regions of strongly variegated leaves showed little contrasting differentiation. No x-bodies were found in chlorotic, green, or transitional areas of the variegated leaves. Light treatments resulted in striking morphological modifications in leaf structure. All attempts failed to transmit the infectious chloroses by any other means than by grafting. Successful transmission was obtained by grafting and budding *E. japonicus aureus* with green *E. japonicus*.

The occurrence of Pythium root-rot disease of maize and sugar cane in the Philippine Islands, E. F. Roldan (*Philippine Agr., 19 (1930), No. 5, p. 327*).—In October, 1929, young corn was found dying prematurely of root rot, the whole root system being water-soaked while the root tops were seriously rotten and flaccid. A Pythium was isloated which proved capable of reproducing the disease.

A sugarcane root rot disease is said to have also been caused by a Pythium in 1926. Numerous cases were again observed in March and in July, 1930. Microscopic examinations of roots with young lesions showed that a Pythium caused the disease. Isolations of this fungus in pure culture were made, and the disease was reproduced by inoculation of single node cuttings of the susceptible variety Luzon White.

Red oxide of copper as a dust fungicide for combating damping-off by seed treatment, J. G. Horsfall (*New York State Sta. Bul. 615 (1932), pp. 26, figs. 4*).—As a result of 15 duplicate tests, red oxide of copper or cuprous oxide used as a seed treatment for tomatoes, eggplants, peppers, and certain other veg-

etable seed seemed to compare favorably with previously recommended materials for increasing stands and for combating damping-off in greenhouse flats caused by Pythium ultimum. It appeared to be somewhat less effective than the copper sulfate soak treatment in combating the postemergence phase of damping-off.

On smooth seeds such as those of eggplants, cuprous oxide was found to be especially desirable because of its adhesiveness. It was found to adhere 2.5 times better than copper sulfate monohydrate on tomato seeds. On a basis of the copper sulfate soak treatment in combating the postemergence phase of drate. The extraordinary adhesiveness of this material suggested its use as a foliage fungicide.

Cupric oxide (black oxide of copper) had but little fungicidal value when used as a seed treatment.

Flag smut in wheat experiments, 1929, R. B. Morwood (*Queensland Agr. Jour., 33 (1930), No. 6, pp. 381–388*).—Outstanding results of the year's work are the confirmation in Queensland of the high degree of resistance to flag smut in the Nabawa and Florence varieties which has been demonstrated for them in other States, and the demonstration of a like or greater degree of resistance in promising crosses obtained by the department of agriculture. The dust treatment of seed wheat has proved ineffective against heavy infections of flag smut. Copper carbonate has been found to be insufficient against heavy infections of bunt.

Observations on flag smut in the permanent manurial field (*Jour. Dept. Agr. Victoria, 28 (1930), No. 9, pp. 530, 531*).—"From these results [1927, 1928, and 1929] it would seem that the conditions brought about by the application of lime definitely favor the disease [flag smut on wheat]; so does the application of the local farmyard manure."

Flag smut of wheat, E. J. Limbourn (*Jour. Dept. Agr. West. Aust., 2. ser., 8 (1931), No. 2, pp. 214–217*).—An account is given of wheat variety resistance tests as against flag smut in the years 1926–1930 on the Merredin Experiment Farm. The results are presented in tabular form with brief discussion.

An arrangement of varieties in accordance with the highest infection percentage for each shows, as free from infection during the term, Dindiloa, Geeralying, Red Rock, Rymer, Sindhi, Stewart, and Sunset. Other varieties classed as resistant (from 1 per cent to not over 10 per cent infection shown) number 45; susceptible (from 11 to 25 per cent), 39 varieties; and very susceptible (over 25 per cent), 37 varieties.

The nature of resistance in alfalfa to wilt (Aplanobacter insidiosum L. Mc.), G. L. Peltier and F. R. Schroeder (*Nebraska Sta. Res. Bul. 63 (1932), pp. 28, pls. 12*).—The results are given of five years' study of alfalfa plants of all ages to determine their reaction to wilt caused by *A. insidiosum*. The normal progress of the bacteria from their entrance into the host plant until its death was studied.

The authors found that resistance in some alfalfas is associated with certain morphological features, particularly in the root, which inhibit rapid development and invasion of the vital tissues by the bacteria. These morphological differences in susceptible and resistant sorts are considered inherent, although not absolute, since any variety or strain of alfalfa is made up of a widely diverse lot of individuals. It is claimed that for this reason not a single variety or strain of alfalfa has been found which is completely resistant.

Rapidly growing alfalfas were usually susceptible, whereas slow growing sorts were relatively resistant. The rate of growth appeared to be associated with certain modifications in the structure, which may either favor or inhibit

the development of the organism. Water in any form was found to be one of the major factors in modifying the rate of growth.

The curtailment of organic food reserves in roots of diseased plants was found to bear an important relation to alfalfa wilt, and this was thought to be caused by the disturbance of the photosynthetic and food-storage activities. No direct physiological or microchemical evidence was found to show that any internal physiologic function of the plant makes one variety more resistant than another, except in so far as morphological modifications may occur under different environmental conditions.

The angular leaf spot of cotton in Egypt, T. FAHMY (*Empire Cotton Growing Rev., 7 (1930), No. 1, pp. 30–36, figs. 6*).—A cotton leaf spot, said to be associated with a bacterium similar to that described by E. F. Smith in connection with cotton angular leaf spot in the United States, becomes widespread in Egypt from August until the plants are removed about November. This appears to be due to the rise of the Nile and the resulting increased humidity. Cotton is, however, largely protected against injury from this cause by its advanced degree of maturity achieved during this season. By sowing time again, moreover, climatic conditions have again become unfavorable to the activity of the disease.

Angular leaf spot of cotton in Egypt, R. E. MASSEY (*Empire Cotton Growing Rev., 7 (1930), No. 2, pp. 127, 128*).—The author refers to an article by Fahmy (see above), an article contributed by R. H. Stoughton,[1] and his own contribution (E. S. R., 65, p. 646), the last-named dealing with the causal organism (*Bacterium malvacearum*) and its forms, including angular leaf spot and black arm.

"Recent work has shown us that actual lesions on the bolls are necessary before the contents can be infected, and this usually involves a systemic infection, but in Egypt the disease runs such a mild course that this degree of infection is rarely attained. It is most probable that the light degree of infection which obtains amongst Egyptian seed is derived from infected débris left in at picking, and from contamination during ginning. We have found that *B. malvacearum* in débris is protected by a layer of slime, and when dry is highly resistant to environmental conditions. As an example, dried bolls bearing lesions have been heated to temperatures between 70 and 80° C. for 48 hours without destroying the pathogenicity of the contained parasite. Moreover, débris collected from the field after exposure to sun and wind for two months has been found to contain the organism in an active state. It is therefore suggested that angular leaf spot in Egypt, and secondary infection (as distinct from the primary infection carried by the seed) in the Sudan, are both traceable to infected débris in which the causal organism has survived from the previous season. A study of the data given in the above-mentioned papers will show that both the character of the disease and the severity of the attack are governed by definite and similar meteorological conditions both in Egypt and in the Sudan. Indeed, it seems probable that the same conditions of temperature and humidity govern the actions of the parasite wherever cotton is grown."

A vector of leaf curl of cotton in Southern Nigeria, F. D. GOLDING (*Empire Cotton Growing Rev., 7 (1930), No. 2, pp. 120–126*).—Cotton leaf curl is claimed to have been first described by Farquharson (E. S. R., 29, p. 749) as on indigenous cottons (*Gossypium peruvianum* and *G. vitifolium*) in the Ishan district of Southern Nigeria. Jones and Mason (E. S. R., 58, p. 847) are said to have noted the striking resemblance between the histological characters marking leaf

[1] Ann. Appl. Biol., 15 (1928), No. 3, pp. 333–341, pl. 1, figs. 3.

curl and the abnormalities accompanying virus diseases, and to have transmitted the disease by budding.

Evidence has now been obtained that an aleyrodid, as yet unidentified, can function as a vector of cotton leaf curl. In six experiments, the period between the introduction of the vectors to cages containing healthy plants and the appearance of the disease was, respectively, 11, 21, 22, 24, 24, and 24 days. It is indicated, but not conclusively, that jassids are unlikely to be important as vectors of leaf curl in Nigeria. The principal natural enemies of white flies are small spiders, which live on the lower surfaces, and an unidentified dolichopodid fly.

Distribution of the cotton root-rot fungus in soil and in plant tissues in relation to control by disinfectants, C. J. King and C. Hope (*Jour. Agr. Res. [U. S.], 45 (1932), No. 12, pp. 725–740, figs. 9*).—In connection with an attempt to control the cotton root rot fungus *Phymatotrichum omnivorum* by the use of formaldehyde, a method was devised for ascertaining the limits of the distribution of the fungus in the absence of indicator plants.

Ditches were dug across the area, and the roots of trees and other woody plants were examined for the presence of the fungus. Mats of mycelium were observed in the trenches, and sclerotia were obtained from numerous borings across the suspected area. The sclerotia were secured by washing samples of soil through sieves, and their vertical and lateral distribution was found to be rather irregular, frequently being concentrated in pockets. While most abundant at from 6 to 42 in. in the soil, some sclerotia were found at a depth of 90 in. Laboratory tests showed that all parts of the sclerotia were capable of producing mycelial growth, and sclerotia from a culture kept 2.5 years in the laboratory germinated and grew vigorously. The fungus was also found to persist in buried tree roots for a considerable time after the tree was killed.

The experiments on control showed that the mycelium and sclerotia were killed by injecting formaldehyde into the soil. Mycelium within the roots was less quickly destroyed.

Tumors and other malformations on certain Nicotiana hybrids, D. Kostoff (*Zentbl. Bakt. [etc.], 2 Abt., 81 (1930), No. 8–14, pp. 244–260, figs. 18*).—The author, signifying his acceptance of such evidence as has been contributed by Smith, Jenssen, and Levine regarding the similarity between animal cancers and plant cancers, presents in the present paper, which is concerned primarily with tumors manifested by the first generation of certain Nicotiana hybrids, what he claims to be new data on the cytology and etiology of the cancer phenomena in plants, attempting to treat the problem from a comparatively new point of view.

Of the available contributions relative to cancer and crown gall, only the more recent are cited in this paper. It is thought by the author that important statements made in this account may be found equally valid for the animal kingdom, in which tumorous formations on animal hybrids are said to have been reported.

A tabulation is given of the character, location, and degree of malformation of certain Nicotiana hybrids, and it is indicated, with discussion, that not all the hybrids resulting from the Nicotiana species hybridizations manifested tumors and other malformations.

A search for *Bacterium tumefaciens* was made in the juice of tumors grown on hybrids. Stem surfaces of *Pelargonium* sp., *Solanum lycopersicum*, *N. tabacum*, *N. glauca*, *N. langsdorffii*, *N. rustica*, *N. sanderae*, *N. paniculata*, and *N. alata* were smeared with the juice of crushed tumors from the hybrids, then punctured, and again smeared. No tumors resulted from inoculations. "The negative results obtained from searches for parasitic agents as responsible

factors in the origin of the tumors drive one to the conclusion that they are of a spontaneous nature. This spontaneous appearance of such tumors on Nicotiana hybrids and their behavior recalls to mind the spontaneous human cancers. . . .

"Substances such as tar, arsenic, indole . . . , metabolic products resulting from abnormal metabolic processes . . . , and others cause cancerous outgrowths in various animals. For the plant kingdom similar results from the activity of foreign external influences are more numerous. Proliferations caused by wounding represent very common phenomena. The causative agents in this instance are obviously the disintegration substances, chiefly amino acids, resulting from the injured cells which, when they penetrate into the surrounding living tissue, act as foreign substances. Still better examples are to be found in plant galls." Detailed comparisons are shown between plant tumors and human cancers.

Parasitism, morphology, and physiology of Fusarium solani (Mart.) Sacc. on onions [trans. title], S. J. DU PLESSIS (*Ann. Univ. Stellenbosch, 10 (1932), A, No. 2, pp. [19], figs. 4; Eng. abs., p. [18]*).—This account discusses aspects of the parasitism, morphology, and physiology of *F. solani* in its relation with onion bulbs. It has been found to cause during storage a dry bulb rot, though it does not attack the growing plants. The optimum growth temperature for the fungus lies between 27.5 and 28.5° C.

Two diseases of peas new to Arizona, J. G. BROWN and M. M. EVANS (*Arizona Sta. Tech. Bul. 44 (1932), pp. 289–324, pls. 4, figs. 13*).—Descriptions are given of a foot rot and of a bacterial blight of peas in Arizona.

The foot rot attacked peas planted in virgin, highly alkaline soil in central Arizona. From the infected pea plants a Fusarium was isolated, grown in pure cultures from a monosporidial source, inoculated into healthy pea plants in which it caused the foot rot, and reisolated. The reactions of pure cultures of the Fusarium on various media are given, also a description of the mycelium and spores and the identification of the fungus as an undescribed variety of *F. merismoides*.

Observations are recorded on the cultural reactions of bacterial blight (*Phytomonas pisi*), a second pea disease previously unreported from Arizona.

Potato diseases in Western Australia.—The Rhizoctonia disease and common scab, H. A. PITTMAN (*Jour. Dept. Agr. West. Aust., 2. ser., 8 (1931), No. 4, pp. 463–476, figs. 7*).—Official figures, as here furnished, indicate for Western Australia, during the seasons from 1920–21 to 1929–30, inclusive, a potato yield averaging 3.8 tons per acre. The highest acre yield recorded was 23 tons 7 cwt. The fortunate combination is required of 9 separate factors, involving the exclusion of all disease effects.

A list is given of 16 causes recorded as affecting potato yield, chiefly diseases, 10 attributed to known organisms and 3 to viruses.

Forms here dealt with in some detail are Rhizoctonia scab, rosette or stem canker, and common scab.

Dry-rot of swedes.—Second progress report, T. WHITEHEAD (*Welsh Jour. Agr., 6 (1930), pp. 289–295*).—In view of the success in achieving protection of swedes from dry-rot as claimed by Cunningham (E. S. R., 62, p. 148) and the discrepant experience reported by the present author with Jones, as previously noted (E. S. R., 67, p. 409), considerable attention was paid to this matter in 1929 by the present author, who now places on record these later attempts, admitting, however, that no final conclusion is yet possible as to the actual mode of transmission of the disease organism (*Phoma lingam*) on commercial samples of seed. This second progress report covers laboratory experiments with seed, field experiments, and field variety trials.

"To sum up the present position, the case against attaching much importance to seed infection as a source of serious outbreaks in the field is unsatisfactory, since it rests almost entirely on the failure to observe disease during the seedling stage, or indeed at any time before the roots are well grown. . . . The evidence in favor of attaching importance to seed infection rests on more satisfactory grounds since, with its occurrence definitely established, it may be supposed that occasionally a heavily infected strain finds its way on the market."

"Downy mildew" (so-called "blue mould") of tobacco, H. A. PITTMAN (*Jour. Dept. Agr. West. Aust., 2. ser., 8 (1931), No. 2, pp. 264–272, figs. 3*).—Though tobacco growing is new and still experimental in Western Australia, an outbreak of downy mildew has already seriously affected crops on two adjoining properties at Manjimup, greatly lowering the financial returns on each. The present note outlines the characteristics of the disease, the symptoms of the diseased plants, the life history of the fungus (*Peronospora* sp.), and preventive measures. The weather factors favoring the most rapid development of this disease are warm, muggy conditions during the day with low temperature at night, or else warm, muggy periods alternating with cold ones, very similar, it is stated, to those favoring epidemics of Irish blight in potatoes and various other downy mildews (so-called) in other plants.

Peach brown rot, J. W. ROBERTS and J. C. DUNEGAN (*U. S. Dept. Agr., Tech. Bul. 328 (1932) pp. 60, pls. 10*).—After a historical account of the occurrence of peach brown rot in the United States and a discussion of the losses caused by the disease and variety susceptibility to infection, the authors described the fungus, its distribution, morphology, growth in artificial media, temperature relations, seasonal life history and pathogenicity, etc.

The authors confirm their previous conclusions that the proper name for the fungus should be *Sclerotinia fructicola* (E. S. R., 52, p. 450). The fungus was found to survive the winter in mummied fruits and cankers, and it is said to be disseminated by rain, winds, birds, insects, and man, winds being the most important agency.

The blossom blight, fruit rot, mummy, canker, and twig blight phases of the disease are considered in detail. While the infection of the floral parts was found to reduce the size of the peach crop, the infection of the fruit as it matures is considered much more serious. Infection was found possible through the uninjured epidermis of the fruit, but most infections were found to follow punctures by the plum curculio and other insects.

The control of the brown rot disease on the fruit is said to depend largely upon an adequate and timely use of fungicides, coupled with proper measures for the control of the plum curculio. Sanitary measures, such as the removal of diseased fruits, the plowing under of mummies, the pruning out of twig cankers, and the elimination of extra sources of infectious material, are all considered of importance in a general control program.

Attempts to control the fungus on fruits with materials that gave off toxic vapors were failures, as they imparted to the fruit odors or flavors that affected the market value of the fruit.

Two strawberry leaf diseases, J. H. SIMMONDS (*Queensland Agr. Jour., 33 (1930), No. 2, pp. 113–117, figs. 2*).—Strawberry leaf scorch (*Diplocarpon earliana*) and eyespot (*Mycosphaerella fragariae*) both overwinter in Queensland on old débris left in the soil or on the plants. Control measures are detailed.

Diaporthe associated with the mulberry blight kangare [trans. title], T. YAMAUCHI (*Bul. Imp. Seric. Expt. Sta., Japan, 8 (1930), No. 1, pp. 1–34, pls. 9,*

fig. 1; Eng. abs., pp. 33, 34).—Typical specimens of mulberry blight obtained from areas where this injury was common showed usually a Diaporthe, said to be identical with the true cause of the disease as studied by other authors and classified as *D. orientaris* (*D. niphonia*).

The fungus has a pycnidial stage, this being the usual form associated with the lesion and having α and β spores. The filiform body in the pycnidium is considered to be a spore. The β spore could not be made to germinate on any media used. The relation between the perithecial and the pycnidial stage has been confirmed by cultural and by serological (agglutination reaction) methods.

Data established by the present author include cultural characters, temperature relation in germination and development, light and fruiting, spore longevity, resistance to heat, and the earliest time of visible occurrence of the fungus on the tree. The optimum temperature for development is about 25° C.

The fungus is found not in snowy localities alone but generally throughout Japan, including the warm southern regions, particularly on the dying trees. Healthy trees are not readily attacked in warm regions. In case of a tree inoculated with diseased bark, the margins of the wound browned slightly or perhaps developed pycnidial pustules.

Though the fungus is evidently intimately related to the disease, the author does not conclude that it is the sole causal agent, as a further essential factor may supposedly be involved. The fungus is scattered all over the land, but the disease phase is restricted to snowy localities. The temperature favoring the development of the fungus is not low, so that the blight occurs only in the limited season of rather high temperature. No sign of the spread by infection from place to place is recognized. Though inoculation experiments showed negative results, the fungus takes hold easily on the tree if injured by other agencies, natural or artificial.

The bacterial wilt of bananas and plantains, S. F. Ashby (*Agr. Jour. Brit. Guiana, 1 (1928), No. 4, pp. 217–220, pls. 4*).—The author, citing his own previous contribution (E. S. R., 58, p. 53), sketches the known history of the bacterial wilt of bananas and plantains in Trinidad and its characterization as produced by *Bacterium solanacearum*, in distinction from the history and characterization of Panama disease as produced by *Fusarium cubense*, and differentiates the two diseases, which have been confused. Symptoms, susceptibility, and control are dealt with.

"Now that this bacterial wilt has become clearly differentiated from Panama disease, it might be of interest to determine if both are present in British Guiana as they are in Trinidad."

The Sclerotium disease of coffee, and its occurrence in this Colony, E. B. Martyn (*Agr. Jour. Brit. Guiana, 2 (1929), No. 1, pp. 7–10, pls. 2*).—A brief general account is given of the coffee Sclerotium disease in British Guiana, its history and general distribution, symptoms and etiology, present occurrence and amount of injury caused, time of appearance, and control measures.

Coffee Sclerotium disease is said to have been the first described as in Surinam in 1913, and investigated in detail by G. Stahel in 1921.[2] It now occurs in the northwest district of the Colony, where it was first recognized in 1914. It has since been found in Trinidad. It attacks chiefly Liberian coffee varieties. In the northwest district it is normally most virulent in September

[2] Dept. Landb. Suriname Bul. 42 (1921), pp. 34, pls. 11; Eng. abs. in Rev. Appl. Mycol., 1 (1922), No. 1, pp. 14–17.

and October, causing from 15 to 20 per cent loss of the total crop. It is best controlled by spraying in connection with the destruction of infected débris.

The Sclerotium disease of coffee: Some notes on the origin of the disease, its outbreak, and control, E. B. MARTYN (*Agr. Jour. Brit. Guiana, 3 (1930), No. 1, pp. 28–34*).—In this second article (see above), a more detailed account is rendered, dealing with inoculation experiments, the establishment of the fungus upon living plants, outbreaks of the disease on coffee, and control of the disease, with details of experimental spraying.

S. coffeicolum seems to live normally as a saprophyte on decayed vegetable matter, but to be able under certain conditions to attack the tissues of living plants. This activity seems to necessitate the production of motile organs, namely the peculiar rigid bristles, the conditions for which in the natural environment of the fungus appear to be seldom attained.

S. coffeicolum is regarded as a weaker parasite than *S. rolfsii*. It attacks the aerial portions of plants and not the root and collar. When conditions are especially favorable the fungus may spread alarmingly. In normal years the damage done is relatively slight. The organism attacks other plants in the neighborhood of the coffee bushes. The essential factor in the attack by this common fungus (ordinarily saprophytic) on living plants appears to be the formation of the bristles, which are described as containing calcium oxalate but as of somewhat rare occurrence. "For active growth the fungus needs continual moisture, and it is only when such prevails to an extreme degree, that the rhizomorphs appear on infected coffee bushes."

Some tree-destroyers belonging to the mistletoe family (Loranthaceae), M. D. SULIT (*Philippine Agr., 19 (1931), No. 10, pp. 665–673, figs. 3*).—The plant parasites here dealt with belong with the family Loranthaceae, and include only two members, both common, *Loranthus philippensis* and *Viscum orientale*, of the 8 genera and 102 species with 1 variety occurring in the Philippines.

The exposition here noted deals briefly with botanical description and distribution, method of dissemination, manner of attack, varietal susceptibility of the host, economic importance, and suggested method of control, involving simply the removal of the parasites and disinfection of the resulting injuries of the trees.

ECONOMIC ZOOLOGY—ENTOMOLOGY

A study of Merriam's temperature laws, S. C. KENDEIGH (*Wilson Bul., 44 (1932), No. 3, pp. 129–143, figs. 2*).—This contribution on the relation of temperature to animal development and distribution is presented in connection with a list of 30 references to the literature.

Life zones, modern ecology, and the failure of temperature summing, V. E. SHELFORD (*Wilson Bul., 44 (1932), No. 3, pp. 144–157, figs. 6.*)—This discussion is presented in connection with a list of 19 references to the literature.

Natural hosts and disseminators of Rickettsia manchuriae (a preliminary note), M. KODAMA, G. TAKAHASHI, M. KOHNO, and Y. FUTAKI (*Kitasato Arch. Expt. Med. [Tokyo], 9 (1932), No. 1, pp. 84–89*).—The authors find that the house rats of endemic areas of the so-called Manchurian typhus fever are the hosts in nature, and they believe that the Rickettsia is transmitted by fleas to man.

Demonstration of Rickettsia manchuriae appearing in the stomach epithelial cells of rat fleas and rat lice infected with so-called Manchurian typhus, M. KODAMA, M. KONO, and K. TAKAHASHI (*Kitasato Arch. Expt. Med. [Tokyo], 9 (1932), No. 2, pp. 91–96, pl. 1*).—In continuation of the studies above

noted the authors report having discovered the massed *R. manchuriae*, the etiological agent of endemic Manchurian typhus, in the stomach epithelial cells of the oriental rat flea and rat lice, obtained from the virus-carrying house rats caught in the Manchurian typhus region near the city of Dairen, or experimentally put on the infected rat. They consider this as conclusive proof in support of their "flea theory of endemic mild typhus."

A comparative life history study of the mice of the genus Peromyscus, A. Svihla (*Mich. Univ., Mus. Zool. Misc. Pub. 24 (1932), pp. 39*).—This is a report of biological studies conducted in the laboratory with *P.* (*Peromyscus*) *maniculatus, P.* (*P.*) *leucopus, P.* (*P.*) *truei, P.* (*Haplomylomys*) *californicus,* and *P.* (*H.*) *eremicus.*

Birds of Massachusetts and other New England States.—Part III, Land birds from sparrows to thrushes, E. H. Forbush ([*Boston*]*: Mass. Dept. Agr., 1929, vol. 3, pp. XLVIII+466, pls.* [*47*], *figs.* [*40*]).—Part 3 of the work previously noted (E. S. R., 58, p. 660), which is a posthumous volume edited by J. B. May, completes the account of the land birds. A biographical sketch of the author, by May, is included (pp. XVII–XLVIII). This volume is illustrated with colored plates from drawings by L. A. Fuertes and A. Brooks.

Pests of ganja (Cannabis sativa), M. C. Cherian (*Madras Agr. Jour., 20 (1932), No. 7, pp. 259–265*).—The pests noted include a mite, 19 insect forms, and a field rat.

A text-book of practical entomology, F. Balfour-Browne (*New York: Longmans, Green & Co.; London; Edward Arnold & Co., 1932, pp. VIII+191, figs. 116*).—Part 1 consists of an elementary course (pp. 3–27) and part 2 of an advanced course (pp. 29–93). Part 3 takes up the principles of systematic entomology (pp. 95–187).

The influence of atmospheric humidity on the thermal death point of a number of insects, K. Mellanby (*Jour. Expt. Biol., 9 (1932), No. 2, pp. 222–231, figs. 5*).—This work is said to be an attempt to investigate the effects of various atmospheric humidities on the death points of insects at high temperatures. A number of species of insects were used, and an attempt was made to correlate the results with those of previous workers.

"An account is given of a technic suitable for exposing small insects to high temperature and air of controlled humidity. Data of survival points obtained from a number of species are given for 1-hour and 24-hour experiments. In the 1-hour experiments, the humidity of the air had no effect on the death point except in the case of large meal worms, which died at 1° C. higher in dry air than in moist. The temperature which any species can stand for 1 hour is sharply defined, but there is a range of 7° between the species of insects worked with. In 24-hour experiments in moist air, all the species died between 36 and 39.5°. Their death was presumably caused by the heat. In dry air those insects not able to conserve their water died at low temperatures, 22° in the case of flea larvae; this was attributed to desiccation.

"There seem to be two main causes of death of insects when they are killed at high temperatures: (1) When the temperature is over 40°, they die from the effects of the heat. (2) Below 36° all the insects experimented with were able to survive at least 24 hours in moist air, but in dry air insects unable to conserve their water may die of desiccation. In hot air, over 40°, certain large insects are better able to survive in dry air, as they keep their bodies cool by evaporating water."

Terrestrial insects and the humidity of the environment, P. A. Buxton (*Biol. Rev. and Biol. Proc. Cambridge Phil. Soc., 7 (1932), No. 4, pp. 275–320, figs. 4*).—Following an introduction, the author deals with the subject under the

headings of gain of water, loss of water, water balance, and the egg. A six-page list of references to the literature is included.

Some aspects of chemical changes during insect metamorphosis, A. C. EVANS (*Jour. Expt. Biol., 9 (1932), No. 3, pp. 314–321, figs. 5*).—In this contribution the changes in carbohydrate content, fatty acid content, and nitrogen distribution are described in detail during the metamorphosis from larva to adult in the sheep blowfly (*Lucilia sericata* Meig.).

"Carbohydrate decreases rapidly until the thirteenth day, after which it remains constant. Glycogen is present. The fatty acid content decreases rapidly until the ninth day. A synthesis of fatty acid now occurs, reaching a maximum on the fourteenth day, after which a decrease sets in until emergence of the adult. The amount of saturated fatty acid present remains constant, the unsaturated fatty acids only being utilized.

"The course of histolysis and histogenesis is reflected in the nitrogen distribution curves. The initial decrease in insoluble protein correlated with a rise in peptone is associated with the formation of the hard chitinous puparium. Continued decrease of the insoluble protein accompanied by a fall in peptone and an increase of soluble protein continues until histogenesis of the imaginal thoracic muscles commences. The insoluble protein now abruptly rises, and the soluble protein shows a corresponding decrease. Formation of excretory-N occurs mainly during histolysis."

[Notes on economic insects and insecticides] (*Jour. Econ. Ent., 25 (1932), No. 6, pp. 1240–1247*).—The contributions here presented supplement those already noted (E. S. R., 68, p. 351) and include the following: The Cribrate Weevil, *Brachyrhinus cribricollis* (Gyllenhal), by E. O. Essig (p. 1240); Observations on Certain Insects in Australia in 1931, by S. E. Flanders (pp. 1240, 1241); Mexican Bean Beetle Injuring Rye, by N. Turner (p. 1241); A New Galleta Grass Gall [*Hilaria mutica*], by W. M. Jones (pp. 1241, 1242); Effect of Yeast on Clothes Moth [Webbing Clothes Moth] Larvae, by W. Colman (p. 1242); The Incompatibility of Barium Fluosilicate and Nicotine Sulfate (pp. 1242, 1243) and Fluorine Residues on Apple (pp. 1243, 1244), both by R. H. Carter; Derris Now Produced and Used on a Large Scale, by R. C. Roark (pp. 1244, 1245); and Further Suggestions for Improving Codling Moth Bait Trap Catches, by J. R. Eyer and E. Tojada (pp. 1246, 1247) (E. S. R., 66, p. 453).

[Report of work in entomology] (*Arkansas Sta. Bul. 280 (1932), pp. 41–45*).—Studies are briefly reported on the rough-headed cornstalk beetle and the strawberry weevil, by W. J. Baerg; biology and control of the black horsefly and biology of the saw-toothed grain beetle (with special reference to rice), by H. H. Schwardt; the rice water weevil, by D. Isely and Schwardt; and the cotton boll weevil, by Isely.

Division of entomology and pest control, D. MOULTON (*Calif. Dept. Agr. Mo. Bul., 20 (1931), No. 12, pp. 745–761*).—A report on the occurrence of and the work of the year with insects, their control, insecticides, etc., conducted by the Department of Agriculture of California.

Report of the entomologist, G. M. LIST (*Colorado Sta. Rpt. 1932, pp. 42–47*).—This is a brief statement of the work under way with codling moth and its control by *Trichogramma minutum* Ril., grasshopper and potato flea beetle control, the relation of the potato psyllid *Paratrioza cockerelli* Sulc. to the potato disease psyllid yellows, and control of onion thrips.

[Work with economic insects and their control] (*Illinois Sta. Rpt. 1932, pp. 127–145, 207, 208, figs. 9*).—A brief account is given of work, by J. H. Bigger, F. C. Bauer, W. P. Flint, L. H. Shropshire, C. C. Compton, S. C. Chandler, C. O. Mohr, M. D. Farrar, J. D. DeCoursey, E. P. Lewis, A. S. Colby, and R. S.

Marsh, with economic insects (E. S. R., 66, p. 244), including corn root worm as influenced by rotation of crops, chinch bug, corn root aphids, white grubs, army worm, Hessian fly, sunflower weevil, insects attacking stored grain and fumigation for them, spraying for the control of San Jose scale, control of peach tree borer with paradichlorobenzene, control work with codling moth, plum curculio control, spraying for onion thrips, the first appearance of the Mexican bean beetle in Illinois, corn ear worm control by *Trichogramma minutum*, oil dusts for peaches and potatoes, sulfur sprays for mites on small fruits, control of leaf tiers by pyrethrum sprays, the control of centipedes and greenhouse red spiders, spraying for control of mealybugs, protection against webworms, control of ox warble flies, and spraying with summer oils for control of grape berry moth.

[Report of the division of entomology] (*New York State Sta. Rpt. 1932, pp. 54–74*).—The findings of the year are briefly summarized as to tests of banding for codling moth, control of the apple leafhopper and cranberry rootworm as apple pests, summer and tar-distillate sprays, control of the pear psylla, pear midge, and quince curculio on pears, notes on the green stinkbug and other species of stinkbugs, the spruce gall aphid, black vine weevil, strawberry root weevil, and other insects injurious to nursery trees, responses of the codling moth and other orchard insects to light, the cherry fruit fly, the place of calomel in root maggot control, naphthalene as an insecticide, apple insects in eastern New York, the oriental fruit moth, the European corn borer, and potato insects, the Mexican bean beetle, and the corn ear worm on Long Island.

Insect pest studies (*Oklahoma Sta. [Bien.] Rpt. 1931–32, pp. 244–274, fig. 1*).—A brief report of the occurrence of and work with economic insects is first given by C. E. Sanborn (pp. 244–248), followed by Anaplasmosis Investigations, by Sanborn, G. W. Stiles, and L. H. Moe (pp. 248–250); Honey Bee Possibilities in Oklahoma (pp. 250–252), The Clover Leaf Weevil (pp. 252–254), and The Corn Leaf Aphid, *Aphis maidis* Fitch (pp. 254, 255), all by G. A. Bieberdorf; Boll Weevil Control Investigations, by E. Hixson (pp. 256–265); and Preliminary Report on the Pecan Phylloxerae (pp. 265–267) and Birds Not Injured by Grasshopper Bait (pp. 268–274), both by F. E. Whitehead.

[Contributions on economic insects in England and their control] (*Jour. Southeast. Agr. Col., Wye, Kent, No. 30 (1932), pp. 63–96, 171–185, figs. 11*).—The contributions relating to insects of economic importance and their control here presented include the following: Studies on the Ovicidal Action of Winter Washes, 1931 Trials, by M. D. Austin, S. G. Jary, and H. Martin (pp. 63–86); The Biological Control of Insects and Weed Pests, by F. Silvestri (pp. 87–96); and The Strawberry Blossom Weevil, *Anthonomus rubi* (Herbst.) (pp. 171–182), and Pyrethrum (pp. 183–185), both by S. G. Jary.

In the report upon studies of the ovicidal action of winter washes, a laboratory method of investigating the action of hydrocarbon and glyceride oils on the eggs of *Lygus pabulinus* L. is described. The ovicidal efficiency of washes prepared from certain tar, petroleum, and vegetable oils and proprietary tar and petroleum preparations of known characteristics and composition, grouped according to the amount and type of oil present, was found to decrease in the following order: 6 per cent petroleum oils>6 per cent vegetable oils=10 per cent tar oils>6 per cent tar oils. Two proprietary Long Ashton two-solution washes at a dilution of 1 in 10 and two Long Ashton one-solution washes at a dilution of 1 in 8 were applied to Ingestre apples. All gave a satisfactory control of *Plesiocoris rugicollis* Fall. and caused no injury to the trees.

The chemical composition of commercially available fluorine compounds, R. H. Carter (*Jour. Econ. Ent., 25 (1932), No. 6, pp. 1224–1227*).—In a survey of the chemical composition of the commercially available fluorine

compounds, in which 57 samples of 15 different materials were received from 16 different sources, the percentage of purity was in general of a high order. "The principal fluorine compounds that are now used as insecticides are sodium fluoride, sodium fluosilicate, barium fluosilicate, sodium fluoaluminate, potassium fluoaluminate, and 'calcium fluosilicate compound.' A few years ago some of these compounds were unavailable. Others were variable in composition, and their high density and other physical properties made them ill-suited for spraying and especially for dusting. At the present time, however, pure fluorine compounds are available, and their physical properties have been improved by admixture of silica and in other ways so that they are quite satisfactory for spraying and dusting purposes."

Manufacture of concentrated pyrethrum extract, C. B. GNADINGER and C. S. COREL (*Indus. and Engin. Chem., 24 (1932), No. 9, pp. 988–991, figs. 3*).—A process is here described for manufacturing concentrated pyrethrum extracts in which ethylene dichloride is used for the extraction. No measurable loss of pyrethrins takes place in the process. It appears that when properly stored the concentrated extract retains its strength for at least 13 months.

Notes on rotenone as an insecticide, N. TURNER (*Jour. Econ. Ent., 25 (1932), No. 6, pp. 1228–1237, pls. 2*).—Tests of the insecticidal value of rotenone as a contact material and internal poison, together with the effect of some materials on the stability of rotenone, are here reported as conducted at the Connecticut State Experiment Station.

It was found that rotenone deteriorates quickly in the presence of soap and water, whether contained in the soap or incorporated in oil which is emulsified with soap. It is apparently stable when it is dissolved directly in oil-soluble sulfonate and in oil when emulsified with powdered skim milk.

"As a contact insecticide rotenone in small amounts is highly toxic to several insects. It is not so effective when applied to insect eggs. Rotenone is a highly effective stomach poison for insects. At the rate of 1 part in 1,000 it killed 80 per cent of the larvae of the Colorado potato beetle within two days. Arsenate of lead at the rate of 1½ lbs. in 100 gal. killed this percentage within one day. Rotenone in as small amounts as 1 part in 12,500 parts of spray killed a large percentage of Colorado potato beetle larvae, but acted very slowly. Judging from the amount of foliage consumed, a dilution of 1 to 12,500 gave adequate protection to the plants. In one test involving small numbers, rotenone at the rate of 1 part in 2,500 of water gave promising results in controlling the cabbage maggot."

The relative toxicity of pyrethrins and rotenone as fly spray ingredients, C. B. GNADINGER and C. S. COREL (*Jour. Econ. Ent., 25 (1932), No. 6, pp. 1237–1240*).—The authors find that the addition of small amounts of rotenone to oil solutions of pyrethrins does not increase the toxicity as much as the addition of the same amount of pyrethrins.

The original habitat and hosts of three major sugar-cane pests of tropical America (Diatraea, Castnia, and Tomaspis), J. G. MYERS (*Bul. Ent. Res., 23 (1932), No. 2, pp. 257–271, pl. 1*).—The author reports upon a study made of the small moth borers of the genus Diatraea, the giant moth borer (*C. licoides*), and the cane froghopper (*T. saccharina* Dist.) of sugarcane, in their respective primitive environments, primarily with a view to finding new parasites for them and secondarily to obtain light on their ecology under agricultural conditions.

The original hosts of the sugarcane borer are shown to be certain aquatic and semiaquatic grasses growing at the edge of forest creeks in the Orinoco Delta and of rivers flowing through the Venezuelan llanos and in lakes of the

Greater Antilles. In the llano habitat *D. busckella* D. & H and *D. impersonatella* Walk. were found under indubitably primitive conditions. The original host of *D. canella* Hamps., another destructive cane species, includes two forms of *Paspalum millegrana* growing on the Trinidad littoral.

Observations on three important forest insects, J. N. KNULL (*Jour. Econ. Ent., 25 (1932), No. 6, pp. 1196–1203, pls. 2*).—This contribution deals briefly with the pine spittle bug (*Aphrophora parallela* Say), which has caused severe damage to Scotch pine plantings in Pennsylvania, and the fruit tree leaf roller and the elm spanworm, which have caused the death of many hardwoods, especially oaks, in various parts of the State. The feeding of adults and nymphs of the spittle bug causes a retardation in growth to such an extent that the Scotch pine die, while the larvae of the leaf roller and spanworm defoliate the trees and make them susceptible to the attack of secondary insects, particularly the two-lined chestnut borer.

Attempts to transmit yellow fever with certain Brazilian mosquitoes (Culicidae) and with bedbugs (Cimex hemipterus), H. W. KUMM and M. FROBISHER, JR. (*Amer. Jour. Trop. Med., 12 (1932), No. 5, pp. 349–361*).—The authors have found that *Culex corniger* Theob., *C. coronator* Dyar and Knab, and *C. surinamensis* Dyar, when in captivity, do not bite either human beings or monkeys. The virus of yellow fever died out rapidly in *Joblotia digitata* Rond., and appeared to die off so rapidly in the bodies of *Cimex hemipterus* Fab. that the disease could not be transmitted by injection of ground-up bedbugs later than the second day after their infecting meal. *Mansonia titillans* Walk. was apparently incapable of transmitting yellow fever by bite, although the virus did remain alive in quantities for as long as 30 days in a single mosquito of this species.

An ecological study of the "lucerne flea" (Smynthurus viridis Linn.), II, D. S. MACLAGAN (*Bul. Ent. Res., 23 (1932), No. 2, pp. 151–190, figs. 10*).—This second contribution (E. S. R., 67, p. 429) deals with the seasonal and geographic variation and abundance of Smynthurus and applied control and remedial measures.

The Mexican species of Amitermes Silvestri (Isoptera), S. F. LIGHT (*Calif. Univ. Pubs. Ent., 5 (1930), No. 10, pp. 215–232, pls. 3*).—This further contribution (E. S. R., 64, p. 750) includes descriptions of four new species of Amitermes, as well as a key to the soldiers of New World species of the genus from British Guiana northward.

Contribution toward a revision of the American species of Amitermes Silvestri, S. F. LIGHT (*Calif. Univ. Pubs. Ent., 5 (1932), No. 17, pp. 355–414, pls. 2, figs. 10*).—In this continuation of the studies above noted 10 new species are described and 2 others reduced to synonymy, leaving a total of 28 American species of the Amitermes here listed.

Control of the cattle louse, Bovicola bovis Linn. (Mallophaga, Trichodectidae), W. E. SHULL (*Jour. Econ. Ent., 25 (1932), No. 6, pp. 1208–1211*).—In this contribution from the Idaho Experiment Station, the author points out that while all breeds of cattle are subject to infestation by the cattle biting louse those having an oily coat are infested to a lesser degree than those which have a drier coat. It appears that this louse may be controlled by applications of sodium fluoride or finely powdered inert dusts.

The phases of locusts in South Africa, J. C. FAURE (*Bul. Ent. Res., 23 (1932), No. 3, pp. 293–405, pls. 26*).—Following a discussion of the theory of phases, as first proposed by B. P. Uvarov in 1921[3] in order to explain the

[3] Bul. Ent. Res., 12 (1921), No. 2, pp. 135–163, figs. 8.

interrelationships of the different forms of *Locusta migratoria* L. and *Locustana pardalina* (Walk.), the author deals at length with observations made during the last four years at the University of Pretoria with *L. pardalina*, *Nomadacris septemfasciata* (Serv.), and *Locusta migratoria migratorioides* Rch. and Fairm. The causes underlying the development of the gregaria characters, the distribution and breeding grounds of *L. pardalina*, the embryonic diapause of *L. pardalina*, an albino race found in *L. pardalina*, *Schistocerca gregaria* (Forsk.), and observations on nonmigratory grasshoppers are considered, followed by a list of 27 references to the literature.

Ecological studies on the Moroccan locust in western Anatolia, B. P. Uvarov (*Bul. Ent. Res., 23 (1932), No. 2, pp. 273–287, pl. 1, figs. 6*).—This contribution is based upon a study of the local locust problem in Turkey made in the summer of 1931.

The migratory locust, W. V. Harris (*Tanganyika Ter. Dept. Agr. Pamphlet 6 (1932), pp. 18, figs. 3*).—This contribution relates to *Locusta migratoria migratorioides* R. & F.

A method employed in rearing thrips, S. F. Bailey (*Jour. Econ. Ent., 25 (1932), No. 6, pp. 1194–1196, fig. 1*).—A description is given of a method successfully employed in rearing thrips in California.

The bionomics and economic importance of Thrips imaginis Bagnall, with special reference to its effect on apple production in Australia, J. W. Evans (*Aust. Council Sci. and Indus. Res. Pamphlet 30 (1932), pp. 48, pls. 3, figs. 13*).—Following an introduction, the author deals with the history of *T. imaginis*, which is indigenous to Australia, presents systematic notes, reports on its life history and bionomics, and discusses severe outbreaks of the pest and their causes, its economic importance, and methods of control.

It is pointed out that serious infestations have been recorded in Australia at intervals during the last 25 years, the primary effect of infestations in apple orchards being a reduction in the crop. Thrips outbreaks in the spring have followed seasons in which the autumn and winter rainfall were above normal. Suggestions are made as to control measures, but no special remedy is advised, particular attention being paid to repellents. Little hope is held out for control by biological methods.

On the control of Antestia lineaticollis Stål (Hem., Pentatom.) on coffee in Kenya Colony, R. H. Le Pelley (*Bul. Ent. Res., 23 (1932), No. 2, pp. 217–228, pl. 1*).—The damage done to coffee by *A. lineaticollis* in Kenya is briefly described, and notes are given on its life history, followed by an account of control measures.

The thermal death-point of Rhodnius (Rhynchota, Heteroptera) under controlled conditions of humidity, P. A. Buxton (*Jour. Expt. Biol., 8 (1931), No. 3, pp. 275–278, fig. 1*).—The author has found that the temperature which is fatal to the first-stage nymph of *Rhodnius prolixus*, a blood-sucking reduviid, is little affected by atmospheric humidity. "At all the humidities death takes place within half a degree of 43° C. on an exposure of 1 hour, and within about half a degree of 40° on an exposure of 24 hours. It is unexpected, but certainly true, that this tiny insect does not lose enough water to be fatal to it if it is exposed for this period to air dried with concentrated sulfuric acid at a temperature of nearly 40°." This was confirmed by suspending nymphs over phosphorus pentoxide in a closed vessel, which was sunk in the tank while the other experiments were in progress.

Reference is made to what is thought to be the only paper of a similar nature, that by Beattie (E. S. R., 60, p. 249), in which it was found that adult Calliphora at 70 per cent humidity can survive 41° for 1 hour but dies at 42°.

The cotton stainer in Piura (Dysdercus ruficollis L.) [trans. title], J. B. Pope (*Estac. Expt. Agr. Soc. Nac. Agr., Lima, Bol. 3 (1929), pp. 14, figs. 6*).—An account of observations of the habits and importance of and control measures for *D. ruficollis* in the Chira and Piura Valleys of Peru.

A preliminary note on the tarnished plant bug (Lygus pratensis Linn.), M. D. Austin (*Jour. Roy. Hort. Soc., 57 (1932), No. 2, pp. 312–320, pls. 3*).—In a study of the severe damage caused by capsids to chrysanthemums in the Worthing area of West Sussex, the tarnished plant bug was found to be the most common under greenhouse conditions. The present preliminary contribution offers observations on the bionomics, host plants, damage, disease trransmission, natural enemies, and control of this pest, with special reference to its occurrence under glass.

Notes on the natural enemies of the sugar-cane froghopper (Tomaspis saccharina Dist.) in Trinidad, with descriptions of new species, A. Pickles (*Bul. Ent. Res., 23 (1932), No. 2, pp. 203–210, figs. 3*).—This is a report upon an attempt to determine what parasites and predators of Tomaspis occur in Trinidad, also to obtain numerical data illustrating their seasonal and geographical distribution and their relative abundance and efficiency. *Abbella tomaspidis* is described as new.

An experimental and observational study of the chinch bug in relation to climate and weather, V. E. Shelford (*Ill. Nat. Hist. Survey Bul., 19 (1932), Art. 6, pp. III+487–547, figs. 37*).—Following a brief introduction, the author deals with length of instars and the life history (pp. 489–515), the cultures (pp. 515–531), and abundance in nature (pp. 531–545). The results of the study are summarized as follows:

"Individual variation in the lengths of instars and life histories is very great, probably on account of the sensitivity of the bugs. Low humidity affects the first instar strikingly and each succeeding stage to a lesser degree. The relations of the rate of development to temperature and humidity are expressible in developmental units, and for each stage an equal-velocity chart is presented, similar to those used by the author in his study of the codling moth. The success of the bugs in a long series of cultures shows that their vigor varies from year to year. The bugs were very strong in 1919 and 1925, producing three or four generations in each of these years. They were weakest in 1921. This does not, however, correspond with the severest outbreaks of the bugs in the State. It does indicate the possible importance of internal factors not directly correlated with the immediate surrounding conditions but determined earlier. It is necessary to consider unbalance in the bugs themselves as well as the unbalance in the system of nature of which they are a part. In the early history of the outbreaks in Illinois there was a striking correlation between human death rate and chinch bug damage. With better developed agriculture and improved sanitary conditions this relation has become less striking."

A list is given of 27 references to the literature.

Mechanical factors affecting the feeding habits of two species of aphids, Macrosiphum ambrosiae and Macrosiphum granarium, F. W. Miller (*Jour. Econ. Ent., 25 (1932), No. 6, pp. 1203–1206*).—This is a report of experiments in which setae of *M. ambrosiae* and the English grain aphid were shortened.

The original description of Dialeurodes citri (Ashmead), E. O. Essig (*Jour. Econ. Ent., 25 (1932), No. 6, pp. 1207, 1208*).—The original description of the citrus white fly which appeared in November, 1883, in a newspaper published in Florida is here reproduced.

Aphididae in Australia, G. H. Hardy (*Roy Soc. Queensland, Proc., 43 (1931), pp. 31–36*).—The author recognizes 23 Australian aphid forms and their hosts, the majority of which appear to be new to the Australian list. A host list is included.

A contribution to the knowledge of Aporia crataegi L. and of some of its parasites and hyperparasites [trans. title], G. M. Martelli (*Bol. Lab. Zool. Gen. e Agr. R. Ist. Super. Agr. Portici, 25 (1931), pp. 171–241, figs. 14*).—This is a report of a study of the bionomics of the hawthorn Aporia, a butterfly formerly placed in the genus Pieris. It is common in Italy, occurring on the Rosaceae, including apple, pear, plum, cherry, apricot, etc., but due apparently to its natural enemies it has never caused serious injury. Following the introductory part the author deals with the morphology of its several stages, its biology, natural enemies, to which particular attention is given, hyperparasites (of *Apanteles glomeratus* Reinh.), and control measures. A list of 52 references to the literature is included.

Attractants for the flying gipsy moths as an aid in locating new infestations, C. W. Collins and S. F. Potts (*U. S. Dept. Agr., Tech. Bul. 336 (1932), pp. 44, figs. 6*).—Investigational work has shown that male gipsy moths are strongly attracted to living virgin females. A scent is given off from hyperdermal glands near the opening of the copulatory pouch and is sensed by the male through its antennae. Some males fly as far as 2.38 miles, but catches at traps are usually made at much shorter distances. The percentage of males recovered is dependent on a number of factors, as distance, wind, temperature, humidity, and topography. The attractant is soluble in fat solvents as ether, benzene, xylene, etc., and can be extracted from female abdominal tips and used in the field in traps for locating new infestations. It is of a complex fatty nature, and is saturated. When exposed it is active for several weeks, a period equivalent to the flight season of the males, owing to the continuous generation of the attractive compound by hydrolysis. At the time the female emerges little attractant is present, but the quantity rapidly increases thereafter for at least one day. The quantity present rapidly decreases after mating.

Some new and important infestations in New England border-infested territory and in New Jersey were discovered by the use of traps containing extracts of female abdominal tips.

The "nettle grub" pest of tea in Ceylon, G. D. Austin (*Tea Quart.* [*Tea Res. Inst. Ceylon*], *4 (1931), No. 3–4, pp. 74–87; 5 (1932), Nos. 1, pp. 4–16; 2, pp. 47–53*).—This deals with the injury caused by slug caterpillars of the family Limacodidae which attack tea in Ceylon and means for their control.

The fir tussock moth (Hemerocampa pseudotsugata McD.), R. E. Balch (*Jour. Econ. Ent., 25 (1932), No. 6, pp. 1143–1148*).—Practically simultaneous outbreaks of *H. pseudotsugata* are reported to have occurred in widely separated areas in the West during recent years, considerable damage having been done in fir forests. In the present account a description is given of the several stages and an outline of the habits and life history of the species, the host preferences of which are said to vary in different areas. The economic importance of the pest and control measures are briefly discussed.

Chemically treated codling moth bands in Pennsylvania, H. N. Worthley (*Jour. Econ. Ent., 25 (1932), No. 6, pp. 1133–1143*).—This contribution from the Pennsylvania Experiment Station (E. S. R., 66, p. 246) reports upon studies of the codling moth bands during the years 1928 to 1931, inclusive.

"Properly prepared beta-naphthol, red engine oil bands of corrugated strawboard prevented at least 95 per cent of the expected emergence of midsummer moths. Toxicity persisted throughout the season, in large part preventing

emergence of moths from overwintered larvae. Toxicity of the bands used seemed to vary with the amounts of the chemicals deposited and persisting in the bands. Narrow bands were as toxic to the larvae as wide bands of the same treatment. Overcrowding in narrow half bands, rather than too much light in the tunnels, seemed to cause larvae to seek wide half bands. No preference for wide bands appeared except in heavily infested orchards. Cocooning larvae showed no preference for any particular type of treated band.

"The percentage of the total population of cocooning larvae trapped under bands seemed to be determined by the extent to which other attractive hibernating quarters could be removed from the trees. Meager figures indicate a total cost of about $4.50 per acre for scraping and banding mature trees. Lowered cost would follow the perfection of a band containing a smaller amount of a more adhesive chemical mixture."

Notes on the early stages of the European pine shoot moth, J. J. DEGRYSE (*Canad. Ent., 64 (1932), No. 8, pp. 169–173, fig. 1*).—Descriptions are given of the egg and first and second larval stages of the European pine shoot moth, now causing widespread damage to pine plantations both in Canada and the United States. Notes on its habits are included.

"The fact that the first stage larvae of the European pine shoot moth feed upon the needles and not upon the buds, as has always been asserted, coupled with the fact that the second stage larvae beside feeding on the needles usually enter the buds at a point not protected by the first web, seems to offer some added possibilities in the application of chemical control methods. Timely treatments with contact and poison sprays or with combinations of both should give good results provided such sprays can be made to spread evenly and adhere for a sufficiently long period to the new shoots and buds. Close attention to the developmental stages of the embryo may further assist in devising effective ovicides as well as in timing sprays to be applied against the hatching caterpillars. It was found that on heavily infested trees quite a few larvae continued to feed on the needles even in the third stage of their development."

Deterrent effect of artificial light on the codling moth, W. B. HERMS (*Hilgardia [California Sta.], 7 (1932), No. 7, pp. 263–280, figs. 4*).—In codling moth light experiments conducted, a preliminary account of which has been noted (E. S. R., 61, p. 251), apples from 51 trees (217,975 apples, including thinnings and windfalls) were examined for worminess. The worminess in apples from the unsprayed, wholly illuminated trees (8 in number) was 49.7 per cent, while the unsprayed check plat, not artificially illuminated, with a similar number of trees, showed 71.3 per cent worminess. "The nonilluminated sprayed trees (15) showed 7.4 per cent worminess. In spite of the fact that a higher artificial-light intensity had been used during the second season's work, the relative reduction in worminess for the entire test plat under illuminated and nonilluminated conditions was not greatly changed, i. e., the first season it showed a reduction of 31 per cent (illuminated 14.5 per cent and nonilluminated 21 per cent), while the second season showed a reduction of 30 per cent (illuminated 49.7 per cent and nonilluminated 71.3 per cent).

"Using a single variety, namely Skinner Pippin, the conclusion is reached on the evidence at hand and under the conditions of this test that the percentage of worminess of apples in the more highly illuminated area is much less than the average for the several varieties combined, i. e., there is an apparent reduction of more than 50 per cent (illuminated 44.1 per cent, nonilluminated 89.1 per cent).

"Since the codling moth deposits eggs rather freely within a light intensity range of from 0.3 to 90.0 foot candles . . . with maximum activity between 25 and 52 foot candles, and in view of the fact that an artificial-light intensity was maintained . . . ranging from 11 to 112 foot candles at best, it becomes obvious that the intensity of artificial light was not sufficiently high to wholly prevent codling moths from entering this area and depositing eggs. There was nevertheless a substantial decrease in moth attack as noted above. It is evident that the effectiveness of artificial-light intensity in deterring moths remains fairly constant over a wide range of intensity, i. e., 30×10^{-5} to $1{,}560\times10^{-5}$, when measured by values of $1/D^2$, as shown by the curve of worminess, and that it is not until the function of $1/D^2$ falls below 30×10^{-5} that worminess increases abruptly."

Armyworms in southern Minnesota, C. E. Mickel (*Jour. Econ. Ent., 25 (1932), No. 6, pp. 1123–1128, fig. 1*).—This contribution from the Minnesota Experiment Station reports upon studies conducted during outbreaks of the alfalfa webworm *Loxostege commixtalis* Walk., the wheat head army worm, the spotted cutworm, and the army worm which occurred in southern Minnesota in 1932. The infestations of the army worms appeared first in winter rye on peat soil and later they migrated to other crops. Elimination of winter rye as a crop on peat soil, pasturing winter rye in fall and spring, close observation of rye fields in May and early June to discover army worms if present, and the use of poison bran mash are suggested as control measures.

Catalase activity in army cutworm moths (Chorizagrotis auxiliaris Grote), J. H. Pepper (*Jour. Econ. Ent., 25 (1932), No. 6, pp. 1128–1133, figs. 2*).—Data are contributed from the Montana Experiment Station to show the relationship between catalase content and physiological activity of army cutworm moths prior to, during, and following the period of estivation. Comparative data are also presented on the catalase content of females of adult two-striped grasshoppers.

Paris green partially adsorbed on charcoal as a larvicide for Anopheles mosquitoes: Larvicide studies, II, A. P. West and P. F. Russell (*Philippine Jour. Sci., 48 (1932), No. 4, pp. 545–561, pls. 2*).—The tests reported in this second contribution (E. S. R., 67, p. 715) led the authors to conclude that charcoal treated with small amounts of Paris green (partially adsorbed) has a pronounced lethal effect on Anopheles larvae. Low concentrations of Paris green (less than 1 per cent) proved to be as efficacious as the standard 1 per cent mixtures of Paris green and diluent as ordinarily used. Combinations of Paris green and borax partially adsorbed on charcoal were not so effective as Paris green and lime. Combinations of Paris green and arsenic trioxide partially adsorbed on charcoal in very low concentrations (much less than 1 per cent) were used with good effect in some tests.

Some studies in the larvicidal effects of arsenicals other than Paris green against Anopheles larvae: Larvicide studies, III, P. F. Russell and A. P. West (*Philippine Jour. Sci., 49 (1932), No. 1, pp. 97–103*).—In this third contribution (see above) experiments are reported dealing with the larvicidal effects of arsenicals other than Paris green when applied to charcoal. They confirm the belief that Paris green is the most effective arsenical larvicide. The fact that Paris green is more efficient as a mosquito larvicide than other arsenical preparations suggests that the copper in Paris green has a real influence in the excellent larvicidal effects of this substance.

Experiments with various toxic substances partially adsorbed on charcoal as an Anopheles larvicide: Larvicide studies, IV, A. P. West and P. F. Russell (*Philippine Jour. Sci., 49 (1932), No. 2, pp. 211–217, pl. 1*).—In further

studies (see above) certain heavy metallic poisons and some miscellaneous nonarsenical substances partially adsorbed on powdered charcoal were tested for their larvicidal properties against Anopheles larvae, but none was found to be as effective as Paris green.

Experimental transmission of tularaemia by mosquitoes, C. B. Philip, G. E. Davis, and R. R. Parker (*Pub. Health Rpts. [U. S.], 47 (1932), No. 43, pp. 2077–2088*).—In transmission experiments with mosquitoes reared from local collections in the Bitterroot Valley, Mont., including *Aedes nearcticus, A. vexans, A. dorsalis, A. stimulans, A. canadensis, Theobaldia incidens,* and *Culex tarsalis,* also the yellow-fever mosquito from imported stock, mechanical transmission was shown to be occasionally possible. Infection was transferred from affected to healthy guinea pigs by interrupted feeding of the yellow-fever mosquito in one instance, and twice by crushing single specimens on the unbroken skin of guinea pigs, 24 hours and 9 days, respectively, after the original infecting feed of the mosquitoes.

It is concluded that "mosquitoes which had fed on an animal infected with tularemia might infect persons mechanically (1) by biting, after having been interrupted during their meal on the infected animal, (2) by being crushed on the skin with or without subsequent rubbing, and (3) by deposition of excrement on the skin." It is pointed out that conditions favorable to such transfers in nature are rare, and that at most only infrequent infection of man would occur in this manner.

The transmission of fowl pox by mosquitoes [trans. title], C. Stuppy (*Zentbl. Bakt. [etc.], 1. Abt., Orig., 123 (1931), No. 3–4, pp. 172–178, figs. 6; Deut. Tierärztl. Wchnschr., 40 (1932), No. 17, pp. 260–264, figs. 4*).—In the experiments here reported *Culex pipiens* and the yellow-fever mosquito transmitted fowl pox to healthy birds 12, 19, and 39 days, respectively, after a single engorgement on affected fowls, and it is considered probable that the mosquito remains infective during its life. The incubation period of the disease when transmitted in this way by either species is from 6 to 8 or 10 days. Inoculation experiments with mosquito material led to the conclusion that the virus occurs in the mosquito itself, and that transmission is not simply mechanical. The work was conducted with a view to amplifying the manner of transmission as reported by Kligler, Muckenfuss, and Rivers in 1929 (E. S. R., 61, p. 274).

Toxicity and permeability.—I, The toxicity of acid and basic solutions of sodium arsenite to mosquito pupae, W. M. Hoskins (*Jour. Econ. Ent., 25 (1932), No. 6, pp. 1212–1224, figs. 3*).—This is a report of studies on the relative toxicity to mosquito pupae of dilute acid and basic solutions of sodium arsenite by determining the lengths of immersion required to cause 50 per cent mortality. "Over the range of concentration 0.01 to 0.03 M, the acidic solutions (pH 5) are approximately four and one-half times as rapid in their toxic action as the basic solutions (pH 11). The results are discussed in terms of the adsorption mechanism of toxic action, and it is suggested that adsorption is important chiefly because it is a step in the penetration of toxic substances. The greater toxicity of acidic solutions of sodium arsenite is attributed to the greater ease of penetration of tissues by the arsenious acid molecules of the acid solutions as contrasted with the difficulty of penetration by the sodium arsenite ions of the basic solutions."

Maggots in the treatment of chronic osteomyelitis, infected wounds, and compound fractures: An analysis based on the treatment of 100 cases, with a preliminary report on the isolation and use of the active principle, S. K. Livingston (*Surg., Gynecol., and Obstet., 54 (1932), No. 4, pp. 702–706, figs. 7; also in Med. Bul. Veterans' Admin. [U. S.], 9 (1932), No. 1, pp. 1–6, pls. 3*).—This report includes a brief account of the production of sterile

larvae of the green bottle fly (*Calliphora erythrocephala*), which were employed as the therapeutic agent. The eggs were gathered each day and sterilized for one hour in a 1 : 1,000 solution of bichloride of mercury containing 25 per cent of 95 per cent alcohol. They were then transferred aseptically to sterile agar and beef slants in test tubes, on which they hatch and feed until used.

"The eggs rather than the maggots are sterilized because they have not yet developed an intestinal tract. The sterile food within the test tube assures that the intestinal tract as it develops will remain sterile. A few eggs from each batch are introduced into glucose broth stratified with mineral oil and incubated at 37° C. for anaerobic growth. If these cultures are cloudy, the maggots from which they are a sample are discarded. Before implantation, the maggots are again bathed in a solution of 1:1,000 bichloride of mercury containing 25 per cent of 95 per cent alcohol for 1 hour and washed repeatedly with normal salt solution to free their surfaces from possible infection and culture tube detritus."

Surgical maggots in the treatment of infected wounds: A convenient blowfly cage, S. W. Simmons (*Jour. Econ. Ent., 25 (1932), No. 6, pp. 1191–1193, figs. 2*).—A description is given of a type of cage which has been found satisfactory for both experimental and quantity production of blowfly maggots for use in the treatment of osteomyelitis.

Studies on the nutrition of blow-fly larvae, I–IV, R. P. Hobson (*Jour. Expt. Biol., 8 (1931), No. 2, pp. 109–123, figs. 4; 9 (1932), Nos. 2, pp. 128–138, fig. 1; 4, pp. 359–377, figs. 2*).—The author reports upon observations and experiments as follows:

I. *Structure and function of the alimentary tract* (pp. 109–123).—The anatomy and histology of the mid-gut and the physiology of digestion of the larva of the sheep blowfly (*Lucilia sericata* Meig.) are described.

II. *Rôle of the intestinal flora in digestion* (pp. 128–138).—Using the same pure strain of *L. sericata* Meig., it was found that "the intestinal flora of Lucilia larvae consists mainly of nonlactose fermenting, Gram-negative bacilli which do not liquefy gelatin. Proteolytic organisms are not present in the gut in significant numbers, but they occur in blown meat. A method of rearing larvae aseptically is described. The eggs are sterilized by treatment with 0.1 per cent mercuric chloride solution and the larvae reared on heated brain mush, sterility being tested by inoculating aerobic and anaerobic media. The absence of symbionts transmitted inside the egg has been concluded from an examination of stained smears and sections of sterile larvae. When larvae are reared aseptically on sterilized brain, the reaction of the gut contents is normal, tryptase is present in the intestine and excreta, and the growth rate is almost the same as in the presence of bacteria. It is, therefore, concluded that microorganisms play no part in intestinal digestion.

"Sterile larvae excrete ammonia, but the amount is insufficient to make the food alkaline until the third or fourth day of larval growth. With infected cultures the reaction is distinctly alkaline on the second day. The ammonifying bacilli isolated from normal larvae are probably responsible for the rapid appearance of ammonia in blown meat."

III. *The liquefaction of muscle* (pp. 359–365).

IV. *The normal rôle of microorganisms in larval growth* (pp. 366–377).

The larvae of the Australian sheep blowflies, M. E. Fuller (*Linn. Soc. N. S. Wales, Proc., 57 (1932), pt. 1–2, pp. 77–91, figs. 22; abs. in Rev. Appl. Ent., 20 (1932), Ser. B, No. 8, p. 163*).—The species of Australian sheep blowflies reported from live sheep, arranged in order of succession, are as follows: (1) Primary, *Lucilia cuprina* Wied. and *L. sericata* Meig. (of which the former is very much more common on live sheep), *Calliphora stygia* F. (which appears to be replaced in Western Australia by *C. australis* Boisd.), *C. augur* F., and

C. fallax Hardy; (2) secondary, *Chrysomyia rufifacies* Macq., *C. micropogon* Big., *C.* (*Microcalliphora*) *varipes* Macq., and *Sarcophaga* spp.; and (3) tertiary, *Peronia rostrata* R. D., *Musca ventrosa* Wied. (*hilli* J. & B.), and *Ophyra nigra* Wied.

Descriptions and a key to the full grown third instar larvae of these species are given, with the exception of *M. ventrosa*, of which no larval material was available. A detailed description is given of the larva of *C. stygia*, and the others are compared with it.

Transmission of paratyphoid (Breslau) by Stomoxys calcitrans [trans. title], W. Birk (*Zentbl. Bakt.* [*etc.*], *1. Abt., Orig., 124* (*1932*), *No. 5–6, pp. 280–300, figs. 15*).—In experiments conducted the author has found the stable fly to be capable of transmitting paratyphoid B (Breslau). In one of the several experiments the disease was transmitted to mice by two flies as long as 14 days after a single engorgement on an infected animal, and in another seven of nine mice were infected by a single fly.

Physiological studies on the effect of flies and fly sprays on cattle, R. Melvin (*Jour. Econ. Ent., 25* (*1932*), *No. 6, pp. 1151–1164, figs. 4*).—It was found in a study conducted in Iowa that all the petroleum oil sprays tested and stable flies caused a measurable rise in body temperature and respiratory rate under certain weather conditions. House flies had no effect upon the body temperature and respiratory rate of cattle.

The blowfly problem: Notes on the effect of carcass burial, M. E. Fuller (*Jour. Council Sci. and Indus. Res.* [*Aust.*], *5* (*1932*), *No. 3, pp. 162–164*).—Four experiments are here reported upon which show that burial of carcasses favors the primary flies and adversely affects the secondary flies. Ordinary compaction of the soil over a buried carcass will not materially impede the wandering of the full-grown smooth maggots of the primary flies. Poisoning with arsenic before burial is efficient in destroying any maggots present in the carcass.

The natural control of the sheep blowfly, Lucilia sericata Meigen, G. Salt (*Bul. Ent. Res., 23* (*1932*), *No. 2, pp. 235–245, figs. 2*).—The author concludes that *Alysia manducator* can not reduce the population of *L. sericata* below the point at which the blowfly fully exploits all the available carcasses. The careful destruction of all carrion, together, perhaps, with the use of trap carcasses, is considered to be of first importance in the control of *L. sericata*.

The structure and development of the reproductive system in the Coleoptera with notes on its homologies, M. E. Metcalfe (*Quart. Jour. Micros. Sci.* [*London*], *n. ser., 75* (*1932*), *No. 297, pp. 49–129, pls. 4, figs. 49*).—This report of studies is presented in connection with a list of 61 references to the literature.

The tile-horned prionus as a pest of apple trees, S. A. Summerland (*Jour. Econ. Ent., 25* (*1932*), *No. 6, pp. 1172–1176*).—The author here considers *Prionus imbricornis*, which injures apple trees of various ages in northwestern Arkansas through attacking the roots, occasionally destroying the stand of trees in small blocks, and threatening the life of whole orchards. Its biology and economic importance are briefly considered in connection with a list of 13 references to the literature.

A study of the life-history and control of Cerambyx dux Fald., a pest of certain stone-fruit trees in Palestine, P. Jolles (*Bul. Ent. Res., 23* (*1932*), *No. 2, pp. 251–256, pls. 2*).—This is a report upon a long-horned beetle, *C. dux*, which is a serious pest of apricots, peaches, and grafted and wild almonds in Palestine.

Strategus simson L. and related West Indian species (Coleoptera: Scarabaeidae), E. A. Chapin (*Jour. Wash. Acad. Sci., 22* (*1932*), *No. 15, pp.*

449–456, figs. 10).—This is a synopsis of the species of the genus Strategus which occur in the West Indies, including the two new species *S. laterispinus*, from Dominican Republic and Haiti, and *S. barbigerus*, an important enemy of sugarcane, from Puerto Rico, St. Croix, and St. John.

A preliminary catalogue of the Chrysomelidae of Oregon, M. H. Hatch and S. Beller (*Pan-Pacific Ent., 8 (1932), No. 3, pp. 102–108*).—A list is given of 101 species and 4 varieties which are thought to represent 90 per cent of the Chrysomelidae occurring in Oregon. Two species are described as new, namely, *Galerucella spiraeophila* Hatch, taken on *Spiraea douglasii*, and *Disonycha latiovittata* Hatch, collected on willow.

Some effects of certain "inert" and toxic substances upon the twelve-spotted cucumber beetle, Diabrotica duodecimpunctata (Fab.), C. H. Richardson and L. H. Glover (*Jour. Econ. Ent., 25 (1932), No. 6, pp. 1176–1181, fig. 1*).—In work at the Iowa Experiment Station adult 12-spotted cucumber beetles were heavily dusted with a number of pulverized substances. "The effectiveness of the materials, based upon the time to kill 50 per cent of the beetles, followed in the order sodium fluosilicate=calcium arsenate>acid lead arsenate>commercial calcium hydroxide=kaolin>gypsum>bentonite. Beyond the points of 50 per cent mortality, the survival curves of calcium hydroxide and of kaolin diverge widely, indicating a greater effectiveness, under these conditions, for the former substance. Examinations of the digestive tracts of dusted beetles before or after death showed that in most instances the ingested bentonite, gypsum, kaolin, or calcium hydroxide had passed into the posterior half of the digestive tract. The presence of the more active arsenicals and sodium fluosilicate was not detected in the gross examinations of the digestive tract."

Further observations on the habits of the raspberry beetle (Byturus tomentosus Fabr.), with special reference to the control of the pest by means of derris, W. Steer (*Jour. Pomol. and Hort. Sci., 10 (1932), No. 1, pp. 1–18, figs. 3*).—This contribution is in continuation of that previously noted (E. S. R., 68, p. 67). Sprays of derris, applied 10 days after the first eggs were observed and again 1 week to 12 days later, gave very efficient control of *B. tomentosus*. The average infestation of loganberries was reduced from 66.3 to 14.6 per cent and of raspberries from 78.3 to 5.6 per cent. The weight of marketable fruit was in the case of loganberries increased from 8.3 to 51.8 cwt. per acre.

Studies on Epilachna lady beetles in Japan, S. Takahashi (*Jour. Tokyo Nōgyō Daigaku (Tokyo Agr. Col.) Japan, 3 (1932), pp. [5]+115, pls. 7*).—This is a detailed account of studies of the life history and bionomics of and control measures for the phytophagous coccinellids *E. 28-maculata* Motsch., *E. niponica* Lewis, and *E. admirabilis* Crotch, the first two of which are sources of serious injury to eggplants, potatoes, etc., in parts of Japan.

Studies on the clover leaf beetle, Luperodes praeustus Motschulsky, in southern Sakhalin [trans. title], M. Hori (*Saghalien Cent. Expt. Sta. Rpts., 1. ser., No. 2 (1932), pp. 105, pls. 4, figs. 4; Eng. abs., pp. 101–105*).—This is a report of studies of *L. praeustus*, said to be one of the most injurious insects in southern Sakhalin since it attacks many kinds of agricultural and horticultural plants on the island. The pest is also known to occur in Shikoku and Chosen, and its subspecies *L. praeustus discrepans* to occur widely in Hokkaido, Honshu, Shikoku, and Kyushu. A list is given of its host plants, 48 species which represent 17 families that occur in southern Sakhalin.

A control for the tobacco flea beetle (Epitrix parvula), E. G. Beinhart (*Jour. Econ. Ent., 25 (1932), No. 6, pp. 1187–1190*).—In work conducted at Upper Marlboro, Md., the author developed an effective spray formula for con-

trol of the tobacco flea beetle which appears to give better control in southern tobacco seed beds than other materials and methods which have been in use for some time. The spray consists of 50 gal. of Bordeaux mixture, 3:3:50 or 4:4:50, 2 lbs. of lead arsenate, and 1 pint of Blackleaf 40 nicotine sulfate.

A contribution to the knowledge of the Scolytidae, [I]—III [trans. title], G. Russo (*Bol. Lab. Zool. Gen. e Agr. R. Ist. Super. Agr. Portici, 19 (1926), pp. 103–260, pl. 1, figs. 48; 25 (1931), pp. 327–349, figs. 6; 26 (1932), pp. 87–114, figs. 8*).—Three studies are reported.

[I]. *A morphological and biological study of Chaetoptelius vestitus (Muls. and Rey) and its symbionts.*—This scolytid enemy of the pistachio tree causes considerable injury in Sicilia. Particular attention is given in this extended account to its natural enemies, especially the hymenopterous parasites, the material being presented in connection with a list of 52 references to the literature.

II. *The almond bark beetle, Scolytus amygdali (Guèrr.).*—This relates to the biology of *S. amygdali*, studied in Sicilia, where it is of particular importance.

III. *Hylesinini of the olive.*—This deals with the biology of five species of the Hylesinini which attack the olive, particularly *Hylesinus taranio* Bern, and *Phloeotribus scarabaeoides* Bern.

Contribution to the knowledge of the French honeysuckle weevil, Bruchidius pygmaeus Boh. [trans. title], E. Del Giudice (*Bol. Lab. Zool. Gen. e Agr. R. Ist. Super. Agr. Portici, 25 (1931), pp. 249–256, figs. 6*).—This is a report of a study of the morphology, biology, injury, and means of control of *B. pygmaeus*, a weevil which infests *Hedysarum coronarium* in the Province of Trapani, Italy.

Studies on the progress of boll weevil infestation at various distances from hibernation quarters, J. C. Gaines (*Jour. Econ. Ent., 25 (1932), No. 6, pp. 1181–1187, figs. 3.*)—The rapidity of boll weevil spread was determined at the Texas Experiment Station by a study of the degree of infestation and screen trap collections of weevils in cotton at various distances from hibernation quarters. "The catch on traps located in fields not planted to cotton, but in the vicinity of cotton, indicates the degree of movement from field to field. Shortly after the peak of catch occurs on these screen traps in the noncotton fields, distribution of weevils has become general throughout such sections regardless of what the previous infestation in cotton has been, and there are present a considerable number of weevils to go into hibernation at places where favorable shelter occurs."

On a suggested method for determining the number of larval instars in Sitodrepa panicea L., M. E. Metcalfe (*Ann. Appl. Biol., 19 (1932), No. 3, pp. 413–419, fig. 1*).—This is a report of a study of the drug store weevil, destructive in stored and dried goods, conducted at the University of Wales.

"A number (887) of larvae of *S. panicea* L. were examined with a view to testing the application of Dyar's law and the possibility of estimating the number of larval instars by measuring the head capsule of a random population. The measurements were found to fall into two groups, one slightly larger than the other, whose growth ratios approximated to two geometrical series, one with a common ratio of 1:12, the other with a common ratio of 1:11. It is suggested that these two groups represent the sexes. On this hypothesis it would appear that the males undergo a minimum of four larval ecdyses, and the females a minimum of five. Miles [see p. 652] postulates a similar phenomenon for several species of Tenthredinidae. Furthermore, the sex ratio is not unity."

My apicultural technic: A new manual of apiculture, C. Barasc (*Ma Technique Apicole: Nouveau Manuel d'Apiculture. Paris: J.-B. Baillière & Sons, 1932, pp. 304, figs.* [*36*]).—This account describes the author's methods.

Definitions of honey color grades, E. F. Phillips (*Jour. Agr. Res.* [*U. S.*], *45 (1932), No. 12, pp. 757–770*).—A report is made of work at the New York Cornell Experiment Station, based upon the examination of 290 honeys from all parts of the United States. It deals with the transmission of light of three wave lengths, namely, blue 480 mμ, yellow-green 580 mμ, red 680 mμ, through 1 cm thickness of numerous honeys, made for the purpose of establishing color grades for honey. Since previous efforts to define the accepted color grades on the basis of minimum transmissions of light for these wave lengths has been found unsatisfactory, it is proposed to define these grades by using the transmission of red light, divided by the transmission of blue light in order to indicate the darkest honeys to be included in each color grade. A discussion of the importance of color grades for honey is included, showing that to a considerable extent color grading is a satisfactory substitute for grading by flavors, since it is impossible to establish flavor grades.

It is believed that if color-grading rules based on these figures are adopted it will be possible for any properly equipped manufacturing concern to make a honey color grader that will meet the demand of the definitions. Further, the color grades will be accurately defined, which hitherto has not been the case.

Hydrocyanic acid in fumigated honey, G. C. Spencer and E. L. Sechrist (*Gleanings Bee Cult., 59 (1931), No. 12, pp. 752–754*).—In experiments conducted to determine whether killing bees through fumigation with calcium cyanide, as employed in foulbrood control, injures honey, a colony of bees, minus the queen, was poisoned by hydrocyanic acid gas according to the customary procedure. "Samples of honey and comb as found together were taken immediately for chemical and biological tests. No odor of hydrocyanic acid could be perceived when the bottles containing the samples were opened. In every case but one chemical analyses of the samples of honey gave negative results for hydrocyanic acid. When fed to bees, honey exposed to hydrocyanic acid caused no greater mortality than did honey not so exposed."

The genus Melipona: The type genus of the Meliponidae or stingless bees, H. F. Schwarz (*Bul. Amer. Mus. Nat. Hist., 63 (1932), Art. 4, pp. 231–460, pls. 10, figs. 2*).—This contribution includes a bibliography of nine pages and an index.

A revision of braconid-species parasitic in the injurious insects of rice-plant and sugar-cane in Japan and Formosa, C. Watanabe (*Sapporo Nat. Hist. Soc. Trans., 12 (1932), No. 2–3, pp. 63–72*).—It is pointed out that up to the present time about 15 braconid species which are parasitic in the injurious insects of the rice plant or sugarcane (Asiatic rice borer, *Chilo infuscatellus* Snell., *Schoenobius incertellus* Walk., *Diatraea venosata* Walk., and *Sesamia inferens* Walk.) have been recorded in Japan and Taiwan. The author having found a number of these to be synonymous with others has thus far recognized 7 species and 1 variety as occurring in Japan and Taiwan. One of these, which has been reared from the larva of the Asiatic rice borer and *Diatraea* sp., is described as new under the name *Bracon* (*Bracon*) *onukii*.

Phaeogenes nigridens Wesmael, an important ichneumonid parasite of the pupa of the European corn borer, H. D. Smith (*U. S. Dept. Agr., Tech. Bul. 331 (1932), pp. 46, figs. 10*).—A report is made on morphological and biological studies of the ichneumonid *P. nigridens*, the most important parasite of the pupal stage of the European corn borer in Europe. This parasite was first introduced into the United States in 1924 in Massachusetts, where it has become

established. A period of about 15 days at a temperature of 77° F. was found to be required for the completion of its life cycle. Its seasonal history synchronizes closely with that of the European corn borer in all the European zones, and it can survive with only one generation a year, although it is known to have at least one other host, a single specimen having been reared from *Tortrix pronubana* Hbn. It may have two or more generations in any of the zones, the additional ones being on the intermediate host.

In the one-generation areas the overwintering female lays its eggs in the Pyrausta pupae formed in the spring and emerges 3 or 4 weeks later, depending on the temperature. These females either hibernate or lay eggs in an intermediate host in the same summer. In the two-generation host zones the hibernating females oviposit in the host pupae and the resulting females attack the summer pupae formed in July and August. The females of this brood then hibernate until the following spring. In these regions there is also a possibility of one or two extra generations on an intermediate host, owing to the presence of laying females in the field at all times.

The maximum parasitism of the host has thus far been recorded as 17.5 per cent. Shipments to the United States of the parasite have been made yearly, chiefly as pupae, at low temperatures, the emergence having averaged 38.5 per cent.

Superparasitism by Collyria calcitrator Grav., G. Salt (*Bul. Ent. Res., 23 (1932), No. 2, pp. 211–216*).—This is a report of a study made of *Collyria calcitrator,* which lays its eggs in England in the eggs of the sawfly of wheat, *Cephus pygmaeus* L. *C. pygmaeus* hatches, completes its larval development, constructs its hibernaculum, and passes the winter with the parasite within its body cavity. It was found that "only one *C. calcitrator* can develop in each *C. pygmaeus,* so that parasites of this species ovipositing in hosts already parasitized endanger or doom their progeny. 3,761 larvae of *C. pygmaeus* were dissected; 1,049 were unparasitized and 2,712 were parasitized by *C. calcitrator;* 2,195 contained one, 332 two, 98 three, 49 four, 18 five, 7 six, 4 seven, 5 eight, 2 nine, 1 eleven, and 1 sixteen parasites. These observed data do not agree, even when corrected for several factors, with the values to be expected from random distribution of the eggs one at a time. The observed data indicate a degree of discrimination on the part of the ovipositing females."

An appendix by R. H. Stoy is included.

Jointworm studies in Utah, G. F. Knowlton (*Jour. Econ. Ent., 25 (1932), No. 6, pp. 1169–1172, fig. 1*).—Contributing from the Utah Experiment Station, the author reports that infestation of dry-farm wheat during 1931 by the second brood of the wheat straw worm was considerably lower and that of irrigated wheat but slightly reduced as compared with conditions during the preceding year. During 1931 the wheat jointworm was found infesting wheat in three Utah areas, the principal injury occurring in the Tooele-Lake Point section. The rye straw worm, *H. websteri* How., is frequently encountered in rye-growing areas of northern Utah, being more generally distributed than the rye joint worm, *H. secalis* Fitch.

The blueberry stem-gall in Maine, L. C. McAlister, jr., and W. H. Anderson (*Jour. Econ. Ent., 25 (1932), No. 6, pp. 1164–1169, pl. 1*).—In studies in Maine the hymenopteran *Hemadas nubilipennis* Ashm. was isolated as the specific cause of the pinkish, kidney-shaped galls on the stems of low-bush blueberries. This insect is capable of causing severe injury through a reduction in the fruiting surface of the plants, but the gall maker has been held in check by the cultural practice of burning over the blueberry fields in rotation every second or third year.

Revision of the chalcid flies of the tribe Decatomini (Eurytomidae) in America north of Mexico, W. V. Balduf (*U. S. Natl. Mus. Proc., 79 (1932), Art. 28, pp. 95, pls. 4*).—In this revision of parasites of the genus Decatoma, 31 species and 6 varieties are dealt with, of which 14 species and 3 varieties are described as new to science.

An attempt to establish an American parasite of the oriental fruit moth in France, H. W. Allen and G. J. Haeussler (*Jour. Econ. Ent., 25 (1932), No. 6, pp. 1148–1151*).—An account is given of an attempted introduction of *Macrocentrus ancylivorus* Roh. from New Jersey into peach orchards infested with the oriental fruit moth in southern France. The parasite was recovered in considerable numbers from subsequent generations of twig-infesting larvae, and the present prospect of its becoming established is considered good.

Description of a new species of ichneumon-fly parasitic on Pyrausta nubilalis Hbn. in Europe, H. D. Smith (*Bol. Lab. Zool. Gen. e Agr. R. Ist. Super. Agr. Portici, 25 (1931), pp. 257, 258, fig. 1*).—Under the name *Campoplex pyraustae* n. sp., the author describes an ichneumon parasite of the European corn borer found in several localities in France.

A contribution to the knowledge of the oriental species of the genus Prospaltella (Hym., Chalcididae) [trans. title], F. Silvestri (*Bol. Lab. Zool. Gen. e Agr. R. Ist. Super. Agr. Portici, 25 (1931), pp. 49–68, figs. 11*).—Reporting upon a study of the parasites of Coccidae, most of which were collected in the Far East in 1924 and 1925, the author deals with the chalcid genus Prospaltella. Ten species are considered, of which six and one variety are described as new.

Growth in the larvae of Tenthredinidae, H. W. Miles (*Jour. Expt. Biol., 8 (1931), No. 4, pp. 355–364*).—The author found that in the Tenthredinidae so far studied growth and development appear to be more complicated than in the larvae of Lepidoptera, first reported by H. G. Dyar.[4]

"In the initial stages growth, as indicated by the width of the head or the width of the frons in successive instars, follows a fairly regular geometrical progression. In the later instars, the influence of sex differentiation and the occurrence in some species of a prepupal stadium, dissociated from growth, renders larval growth irregular. Since growth does not follow a regular geometrical progression throughout the larval life, Dyar's law for growth in the larvae of Lepidoptera has only a limited application to growth in the larvae of Tenthredinidae.

"The present study of growth in four species of Tenthredinidae suggests that Dyar's law can be used satisfactorily to check the number of ecdyses during that part of the larval life directly associated with feeding and increase in size. Observations on the increase in width of the head and frons in successive larval instars indicate that either may be used as a unit for measuring growth in Tenthredinidae. The characteristic splitting of the head capsule at ecdysis renders it more convenient to use the width of the frons as the unit for measuring growth in tenthredinid larvae."

On the biology of the apple sawfly, Hoplocampa testudinea Klug., H. W. Miles (*Ann. Appl. Biol., 19 (1932), No. 3, pp. 420–431, pls. 3*).—The author reports upon a study of the biology and control of *H. testudinea*, which has been under observation for several years in the northwest of England.

Some injurious and beneficial mites on top and soft fruits, A. M. Massee (*Jour. Pomol. and Hort. Sci., 10 (1932), No. 2, pp. 106–129*).—The author lists and reports upon the injurious and beneficial mites occurring on the strawberry, bush and tree fruits, and nuts.

[4] Psyche, 5 (1890), No. 175–176, pp. 420–422.

The toxicity of the vapours of volatile organic compounds to the "red spider" mite (Tetranychus telarius L.).—Part I, Some aliphatic alcohols and their formic esters, W. H. Read (*Ann. Appl. Biol., 19 (1932), No. 3, pp. 432–438*).—The author found that in general the toxicity toward the common red spider of the normal aliphatic alcohols and their formates at first increases as the series is ascended. "Methyl formate is an exception to the above rule and is the most toxic of the formates tested. The normal compounds are more toxic than their isomers, the toxicity decreasing with increased branching of the chain. The above decrease is greatest when the branching is at the α position to the hydroxyl or carboxyl group. The relative effects of the compounds on plants are similar to their effects on the mite, but the differences due to molecular structure are more pronounced. Control of the mite can not be obtained on tomato plants without injury by the use of any of the substances tested."

ANIMAL PRODUCTION

Physiology of farm animals, F. H. A. Marshall and E. T. Halnan (*Cambridge, Eng.: Univ. Pres, 1932, pp. XIV+366, figs. 118*).—This treatise, dealing with the manner in which the bodies of the various domesticated animals are built up, the function of each part, and the laws governing the activities, is designed particularly for students of physiology as well as for a guide to the modern science of animal nutrition.

[Experiments with livestock] (*Arkansas Sta. Bul. 280 (1932), pp. 20, 21, 36–39*).—Data are reported on the progress of feeding trials on the value of fertilized pastures for beef cattle, by M. Nelson; the influence of rice polish on the quality of pork; and soybeans for growing and fattening swine, by E. Martin; the influence of minerals, cod-liver oil, alfalfa leaf meal, and sprouted oats on the production, hatchability, and fertility of eggs; and the value of rice by-products for laying hens and in the growing ration, by R. M. Smith.

[Experiments with livestock] (*Colorado Sta. Rpt. 1932, pp. 20–22*).—This report includes preliminary results of studies on creep feeding beef calves, wintering yearling heifers and heifer calves, a comparison of grains and protein supplements for fattening hogs in dry lot, the value of a succession of annual pastures for swine, and a comparison of roughages and protein supplements for fattening lambs,

[Experiments with livestock] (*Illinois Sta. Rpt. 1932, pp. 70–84, 85–97, 107, 108, figs. 7*).—The results of tests with beef cattle included data on a comparison of feeding qualities of cattle of different ages and grades, the value of ground oats as the only roughage for fattening cattle, the advisability of feeding aged western cows or retaining them to raise a calf crop and then fattening the cows, a comparison of cottonseed meal and soybean oil meal as supplements for pasture-fed steers, alfalfa as a pasture crop for beef cattle, and a comparison of ear corn silage and shelled corn for steers, by H. P. Rusk and R. R. Snapp; artichoke silage as a feed for beef cattle, by Rusk; a simplified method for measuring the net energy values of feeds and rations, by H. H. Mitchell and T. S. Hamilton; and a comparison of yearling and baby beef, by S. Bull, F. C. Olson, Mitchell, and Hamilton.

The swine tests dealt with protein supplements for cheap corn, by W. E. Carroll, G. E. Hunt, and R. H. Goold; the optimum percentage of protein for swine, by Carroll, Mitchell, and Hamilton; factors other than soybeans responsible for soft pork, by Bull, Olson, Carroll, and Hunt; iron in the treatment of nutritional anemia, and the value of oat hulls as a feed for swine, both by Mitchell and Hamilton; the value of grinding oats for swine, by Carroll and

Hunt; and a comparison of bone meal and dicalcium phosphate as calcium supplements for swine, by Carroll, Hunt, Mitchell, and Hamilton.

The poultry studies included data on the value of feeding cod-liver oil every second or third week instead of continuously, by H. J. Sloan and L. E. Card; the vitamin E requirements of breeding fowls, and feeding standards for turkeys, both by Card, Mitchell, and Hamilton; and the value of soybean oil meal as a protein supplement for chicks, by Card.

Other studies included data on the supplementing effect of milk and meat proteins upon cereal proteins, by Mitchell, Hamilton, and D. B. Smuts; and protein requirements of sheep, by Mitchell, Hamilton, and W. G. Kammlade.

[Livestock experiments in Oklahoma] (*Oklahoma Sta. [Bien.] Rpt. 1931–32, pp. 61–87, 98–125, 128–136, 137–140, 143, 144, 178–184, figs. 4*).—Data from studies with beef cattle are reported on a comparison of purebred and scrub bulls for producing market calves, by W. L. Blizzard, W. A. Craft, and L. E. Hawkins; grazing native pastures in Oklahoma, by Blizzard, Hawkins, and B. L. Kiltz; breeding as a factor in baby beef production, by Blizzard and Hawkins; and a comparison of rations for fattening steer calves, by Blizzard.

Swine feeding studies report results on the influence of protein on prenatal and postnatal development in swine, by Hawkins; influence of protein intake on reproduction, comparison of common minerals in swine rations, cottonseed meal as a protein supplement for hogs, and how to prepare wheat for feeding hogs, all by C. P. Thompson.

The results in sheep studies include a comparison of rations for lambs and the effect of ration on wool composition, by A. E. Darlow.

In poultry studies data are reported on the effect of fiber in the turkey ration and incubation studies of turkey eggs, by O. E. Goff; extent and prevention of injury to turkey hens during the breeding season and fertility of turkey eggs following mating, by W. P. Albright; breeding turkeys in confinement, by Albright and R. B. Thompson; rearing turkeys in confinement, by Thompson, Albright, and E. E. Schnetzler; soybean meal as a protein supplement in poultry rations, by Thompson; cottonseed meal and peanut meal as feeds for baby chicks, by Goff and R. Penquite; the relation of winter lights to hatchability, the effect of continuous light upon hens, all mash v. grain and mash, and game bird propagation and distribution, by Penquite and Thompson; effect of sorghum and wheat smuts on chickens, by Penquite and V. G. Heller; correct amount of protein in chick rations, by L. Morris and Heller; amount of fiber for baby chicks, by Morris, Heller, and Thompson; feeds and their relation to egg quality, by Thompson, Albright, Schnetzler, and Heller; capon production, by Penquite; and mineral nutrition studies with chicks, by Heller.

Nutrition studies applying to all classes of livestock were concerned with the rate of oil development in cotton seeds and the effect of gossypol and other cottonseed by-products upon animals and their products, by W. D. Gallup; and the effect of saline drinking water on farm animals, by Heller.

The nutritive value of certain animal protein concentrates, P. B. Curtis, S. M. Hauge, and H. R. Kraybill (*Jour. Nutrition, 5 (1932), No. 5, pp. 503–517, figs. 3*).—In this study at the Indiana Experiment Station an effort was made to determine the amount of hot water soluble protein in tankages and meat scraps as a means of evaluating their nutritive value. A study was also made of the nutritive value of two of the original products and their water soluble and insoluble fractions when used as a supplement to corn.

The commercial digester tankages studied showed variations in their content of hot water soluble protein ranging from 27.3 to 45.8 per cent of the total protein. Commercial meat scraps and reduction tankages to which no "stick" or blood or combinations of the two were added were usually lower in this

respect than digester tankages. Super meat scrap consisting largely of degreased adipose tissue were high in this protein fraction, while dried whole blood and coagulated blood were low.

When fed at 15 per cent levels as the sole source of protein, the hot water soluble portion of tankages was inadequate for the maintenance of rats. The soluble fraction and commercial stick due to the deficiency of tryptophane and cystine had little value for supplementing the protein of corn alone, but because of their lysine content had some value in supplementing a combination of the proteins of corn and wheat bran. At the same levels the original tankage and the water insoluble portion as the sole source of protein did not support satisfactory growth. As supplements to corn they were both satisfactory with the insoluble portion slightly superior to the original tankage, but as supplements to corn and wheat bran this difference was less marked.

A type of blindness in rats, apparently due solely to tryptophane deficiency, is described. The value of determining the amount of hot water soluble protein in tankages as a measure of its nutritive value is discussed.

The vitamin A and the vitamin E content of field-cured and artificially cured alfalfa hay, I. L. HATHAWAY, H. P. DAVIS, and R. R. GRAVES (*Nebraska Sta. Res. Bul. 62 (1932), pp. 15*).—In cooperation with the U. S. D. A. Bureau of Dairy Industry this study was undertaken using rats as experimental animals. Field-cured hay was cocked after lying in the field for about 8 hours and allowed to cure for about 8 days in the field. The artificially cured hay was hauled to a drier as soon after cutting as possible. In color the field-cured hay was olive green, while the artificially cured hay was dark green.

Rats were fed a ration adequate in all respects but vitamin A, and the potency of the two hays was determined by ascertaining the minimum quantity of each required to cure induced symptoms of vitamin A starvation and to cause an average gain in weight of 3 g per week. Under the conditions of this test the artificially cured hay was twice as potent in vitamin A as the field-cured hay.

The vitamin E content of the hays was determined by comparing the number of litters produced by groups of female rats receiving graded quantities of one or the other hays as their source of vitamin E. It was found that artificial curing tended to preserve the vitamin E content of the hay to a greater degree than did field curing.

Commercial feeding stuffs, L. S. WALKER and E. F. BOYCE (*Vermont Sta. Bul. 349 (1932), pp. 46*).—This is the usual report of the analyses for protein, fat, and fiber of 2,070 samples of feeding stuffs, collected for official inspection during April, 1932 (E. S. R., 68, p. 364).

Zebu (Brahman) cross cattle and their possibilities in North Australia, R. B. KELLEY (*Aust. Council Sci. and Indus. Res. Pamphlet 27 (1932), pp. 63, figs. 15*).—Observations and data based on investigations in the United States, the meat markets of London, the Animal Breeding Research Institute, Edinburgh University, and similar institutions in Great Britain are presented in this paper in an endeavor to determine the possibilities of using zebu cattle in North Australia. From these observations the author believes that the introduction, selection, and hybridization of zebu cattle into the areas of Australia unsuited to British-bred cattle would be entirely worth while.

The appearance and behaviour of pigment in the Suffolk breed of sheep, E. BOYD (*Ann. Appl. Biol., 19 (1932), No. 4, pp. 568–583, pls. 3, figs. 5*).—A detailed study was made of samples of wool fibers selected from the following regions of five lambs of the Suffolk breed: Median dorsal neck, median ventral throat, left shoulder, left flank, left rump, britch, belly, and left thigh. The fibers were studied both macroscopically and microscopically as age advanced

from birth to maturity, and it is pointed out that the physical structure of the fiber cuticle obviates the possibility of pigment inclusion in the fiber. A minor or negligible rôle is given to temperature in the stimulation of the pigmentary system.

Colorado dryland fattening rations for lambs, H. B. Osland, E. J. Maynard, and J. F. Brandon (*Colorado Sta. Bul. 395 (1932), pp. 20, figs. 2*).—This bulletin contains data on the results of three feeding tests with lambs, the first of which was previously noted (E. S. R., 63, p. 60).

In the second test seven lots of 20 lambs each were fed for 113 days on a basal ration of cottenseed meal and cane fodder. Five lots were made up of western lambs showing a preponderance of Hampshire, Suffolk, and Rambouillet blood, while the last two lots were high-grade Hampshire lambs. In addition to the basal ration the lots received shelled corn; shelled corn and alfalfa meal; shelled corn and Sudan meal; ground hog millet and alfalfa meal; ground corn, ground millet, and alfalfa meal; ground millet and alfalfa meal; and whole millet and alfalfa meal, respectively. Lot 4 made an average daily gain of 0.4 lb. per head, while the remaining lots gained at the rate of 0.3 lb. per head daily. In this test the hog millet produced faster and more economical gains than corn, but the mixture of corn and millet was not as efficient as either grain alone. The results also showed that it was profitable to grind the millet. Replacing half of the cottonseed meal with either alfalfa or Sudan meal reduced the cost of gains without affecting the rate of gain, and the alfalfa meal was somewhat more efficient than the Sudan meal. The western lambs made larger and slightly more economical gains than the native lambs.

In the third test ten lots of 25 lambs each were fed for 100 days. All lots received cottonseed meal, with lots 1 to 6, inclusive, and lots 9 and 10 receiving cane fodder. The remainder of the ration in the respective lots was shelled corn and alfalfa meal; shelled corn and Sudan meal; ground hog millet and alfalfa meal; ground corn, ground millet, and alfalfa meal; whole millet and alfalfa meal; ground millet, alfalfa meal, and millet hay; ground millet, Sudan meal, and millet hay; shelled corn to native wethers; and shelled corn to native ewes. The average daily gains were 0.2 lb. per head daily in lots 4, 6, 7, 8, and 10, and 0.3 lb. per head in the remaining lots. In this test millet had 82.4 per cent the feeding value of corn. It was again found profitable to grind the millet for lambs. Mixtures of cottonseed meal and either alfalfa or Sudan meal produced smaller but more economical gains than cottonseed meal alone. In this work the Sudan meal proved to be somewhat more economical than the alfalfa meal, especially when fed with millet hay. Cane hay was a more satisfactory roughage for lambs than millet hay. The native wethers made larger and more economical gains than the native ewes, but there was no outstanding difference between fattening natives and westerns.

Fattening lambs on corn, milo, hegari, wheat, and oats, with cottonseed cake and alfalfa, A. K. Mackey and J. M. Jones (*Texas Sta. Bul. 465 (1932), pp. 20*).—Continuing these lamb-fattening experiments (E. S. R., 66, p. 60), it was shown that the addition of cottonseed cake to a ration of alfalfa and grain resulted in a marked decrease in the amount of grain and hay required per unit of gain and when added to a ration of whole threshed sorghum grain and alfalfa increased the rate of gain. The productive value of cottonseed cake in a ration of threshed milo and alfalfa was appreciably higher than its calculated value in a balanced ration. Cottonseed cake increased the appetite of the lambs and improved their carcasses because of the higher finish.

There was no advantage in grinding threshed milo or hegari for lambs. When fed with cottonseed cake oats produced satisfactory gains, and when

fed according to appetite effected a saving in alfalfa. Feeding ground ear corn with husks did not produce as much finish as shelled corn, but the lambs made good gains and required less grain and hay per unit of gain. Wheat and hegari or a combination of the two produced practically the same gains as shelled corn. The carcasses of lambs fed shelled corn showed more finish than those fed wheat, and wheat produced better finished carcasses than hegari. The productive energy values of these feeds calculated from the results of the feeding tests agreed closely with those calculated from production coefficients and analyses of feeds.

Light feeder lambs required less feed per unit of gain than medium weight lambs, but lacked in finish as compared to the heavier lambs when fed for the same length of time.

Colorado dryland fattening rations for swine, E. J. Maynard, H. B. Osland, and J. F. Brandon (*Colorado Sta. Bul. 396 (1932), pp. 20, figs. 3*).—This bulletin contains data on the results of three swine feeding tests, the first of which was previously noted (E. S. R., 62, p. 254).

In the second test 9 lots of 10 pigs each, averaging approximately 70 lbs. per head, were fed for 120 days. The grains fed were in lot 1, shelled corn; lot 2, ground barley; lot 3, ground millet; lots 4, 6, 7, and 8, ground corn and ground millet; lot 5, ground barley and ground millet; and lot 9, ground hay-millet seed. A protein mixture composed of tankage, cottonseed meal, and alfalfa meal 2 : 1 : 1 was fed in lots 1, 2, 3, 4, 5, and 9. Lot 6 received no protein supplement; lot 7, 60 per cent of protein tankage; and lot 8, 50 per cent of protein meat and bone meal. The average daily gains in the respective lots were 1.9, 1.6, 1.8, 1.9, 1.8, 0.6, 1.9, 2, and 1.8 lbs. per head. In this test ground millet had a feeding value of 98.9 per cent that of shelled corn, and ground barley 85.4 per cent, while ground hay-millet seed had 91.5 per cent that of ground millet. When mixed with corn or barley, millet increased the feed consumption and daily gains and reduced the protein requirements as compared with a single grain. Of the protein supplements 60 per cent tankage proved to have the highest feed replacement value, followed in descending order by the meat and bone meal and the triple mixture.

The third test was conducted for 115 days with 9 lots of 7 pigs each, averaging 48 lbs. per head. The scheme of feeding in the first 7 lots was a duplication of the above plan, and lot 8 received the same ration as lot 9 above. In this test lot 9 was fed ground corn, ground millet, and a protein supplement made up of equal parts of tankage and cottonseed meal. The average daily gains in the respective lots were 1.5, 1.3, 1.5, 1.4, 1.4, 0.3, 1.7, 1.4, and 1.5 lbs. per head. Based on the results of this test barley had 73 per cent the feeding value of corn, millet 87.9 per cent, while the hay-millet seed was worth 104.9 per cent as much as the millet. The difference in the value of millet in this and the previous test was due to the fact that the millet in the last test was not thoroughly ground. Difficulty was experienced in feeding the lot receiving no supplement, and the animals showed definite signs of malnutrition. Tankage again proved to have the highest feed replacement value, followed in descending order by the double and triple mixtures.

The use of ice in curing pork on the farm, J. C. Grimes, W. E. Sewell, and G. J. Cottier (*Alabama Sta. Circ. 62 (1932), pp. 8, figs. 2*).—Based on the results of 20 tests, recommendations are made for the successful curing of pork under southern conditions either by the brine cure or the dry cure methods. The following points are essential to the success of these methods: (1) Sanitation, (2) thorough chilling during the 24 to 48 hours immediately following slaughter, (3) complete coverage of the meat with the curing mix-

ture, and (4) careful separation of each piece of meat during the curing process. The last two points apply only to the dry cure method. The brine cure was safer than the dry cure during warm weather.

Liquid and condensed milk for chicks, R. E. ROBERTS (*Poultry Sci., 11 (1932), No. 4, pp. 226–233*).—This study, made up of five experiments involving 19 lots of chicks, was undertaken at the Indiana Experiment Station to determine the optimum amount of meat scrap to use for chicks up to 8 weeks of age when the only drink offered was liquid skim milk, and to obtain more information on the relative value of liquid buttermilk, liquid skim milk, and condensed buttermilk.

Chicks receiving mashes containing 0, 5, 10, and 15 per cent of meat scrap with liquid buttermilk ad libitum showed growth rates during the first 8 weeks which varied directly with the amount of meat scrap fed. The increased gains were apparently due to the extra protein rather than to the minerals furnished by the meat scrap. Liquid skim milk and condensed buttermilk were equal or superior to liquid buttermilk when fed with the same mash. A mash containing 10 per cent of meat scrap fed with liquid milk as the only drink appeared to be a practical feed for growing chicks. The chicks making the largest gains as a rule consumed the largest quantities of both mash and milk and also required less feed to produce a unit of gain. The choice of liquid buttermilk, liquid skim milk, or condensed buttermilk should depend upon cost, availability, and convenience of feeding.

The comparative value of yellow corn, yellow milo, and hegari in a diet for growing chicks, B. W. HEYWANG and R. B. MORGAN (*Poultry Sci., 11 (1932), No. 5, pp. 307–317, fig. 1*).—White Leghorn chicks were divided into five lots of 40 birds per lot in each of two experiments at the U. S. Poultry Experiment Farm, Glendale, Ariz. The basal ration used contained 40 per cent of yellow corn meal, while in the experimental diets yellow milo meal or hegari meal replaced from 50 to 100 per cent, respectively, of the yellow corn meal. Both tests were conducted for periods of 13 weeks.

It was found that either yellow milo or hegari could replace from 50 to 100 per cent of yellow corn in an otherwise adequate diet, particularly if the ration was fed until the chicks averaged about 1.5 lbs. in weight. The growth-feed consumption ratio was not appreciably changed by the substitution of either of these sorghums for the yellow corn. The "physiological" efficiency was progressively lowered by the substitution of 20 or 40 per cent of either of these grains for equal weights of yellow corn, but the significance of this difference was not clear.

Grain and skimmilk versus grain and mash for egg production, O. S. WILLHAM ([*Oklahoma*] *Panhandle Sta., Panhandle Bul. 44 (1932), pp. 10*).—White Leghorn pullets were divided into three lots of 21 birds each and were fed for approximately 10 months. The housing and pastures provided were the same for all lots. Lot 1 received a laying mash which had been successfully used in egg-laying contests with wheat as a scratch feed; lot 2 was fed a mash made up of as many home-grown grains as possible with wheat as a scratch feed; while lot 3 received only whole wheat and skim milk.

When plenty of winter pasture was available lot 3 came within 1.9 cts. per pullet of making as large a margin over feed costs as lot 1 and within 19.8 cts. as much as lot 2. The feed cost per dozen eggs was 0.05 ct. more in lot 3 than in lot 1 and 0.76 ct. more than in lot 2. The production in lot 3 was more susceptible to environmental changes than production in the other lots. The ration fed in lot 2 was more efficient than either of the other rations. The birds in lot 3 carried the most flesh, while those in lot 1 were the thinnest. There was no evidence of internal parasites in any of the lots.

Crude fiber in chicken rations, L. Morris, R. B. Thompson, and V. G. Heller (*Poultry Sci., 11 (1932), No. 4, pp. 219–225*).—Continuing this study (E. S. R., 64, p. 763) at the Oklahoma Experiment Station, six lots of chicks were fed rations varying in fiber content from 3 to 10 per cent. The averages of two years' work showed little difference in the coefficients of digestibility of the various nutrients for the different lots. Even the 10 per cent level of fiber did not materially depress the digestibility of the other nutrients. The rate of growth and feed consumption were practically the same in all lots up to 21 weeks of age. While mortality varied among the lots, there was no correlation between this factor and the amount of fiber in the ration. The average age of maturity and the average egg production per hen was not affected by the percentage of fiber in the ration.

These results indicate that the amount of fiber in the chick ration can be increased to as much as from 8 to 9 per cent without harmful effect on chick mortality, rate of growth, feed consumption, age of maturity, or egg production.

Sources of vitamin A, particularly alfalfa products, for maintaining the life of chicks, B. W. Heywang and H. W. Titus (*Poultry Sci., 11 (1932), No. 4, pp. 234–238, figs. 2*).—Two experiments, each of 140 days' duration and involving six lots of 38 day-old White Leghorn chicks in each test, were undertaken at the U. S. Poultry Experiment Farm, Glendale, Ariz. The basal rations used in the two tests were practically identical. To the basal diet were added varying amounts of the following vitamin A supplements: Fresh alfalfa, sun-cured alfalfa meal, sun-cured alfalfa leaf meal, cod-liver oil, and yellow carrots.

It was found that vitamin A had a distinct value for maintaining life in chicks fed a ration deficient in protein as well as in vitamin A. In this study fresh alfalfa, cod-liver oil, and yellow carrots were richer in vitamin A than either sun-cured alfalfa meal or leaf meal. While the sun-cured alfalfa meal was less satisfactory than the sun-cured alfalfa leaf meal as a source of vitamin A, neither supplement when fed at a 10 per cent level was adequate for satisfactorily maintaining life in these tests.

In both tests the birds receiving the basal ration only or the basal ration plus carrots or cod-liver oil had colorless skins and shanks, while those receiving alfalfa products had skins and shanks of varying shades of yellow.

Does vitamin A possess vitamin D-sparing properties when fed to growing chicks? J. E. Hunter, R. A. Dutcher, and H. C. Knandel (*Poultry Sci., 11 (1932), No. 4, pp. 239, 240*).—Continuing this study at the Pennsylvania Experiment Station (E. S. R., 66, p. 261), it was found that adding vitamin A in the form of alfalfa leaf meal to leg weakness-producing rations supplemented with irradiated ergosterol did not appear to have a sparing effect so far as the ossifying properties of vitamin D were concerned.

The influence of vitamin D on hatchability and egg production, H. D. Branion and J. B. Smith (*Poultry Sci., 11 (1932), No. 5, pp. 251–265, fig. 1*).—Studies reported in this paper from the Ontario Agricultural College, Canada, were planned to compare the influence of vitamin D from cod-liver oil and from irradiated ergosterol on hatchability and egg production. Six lots of 14 Barred Rock pullets and one male each were placed in batteries away from direct sunlight and were fed a basal diet containing little or no vitamin D. To the basal diet was added in the respective lots: No supplement, 2 per cent of cod-liver oil, 2 per cent of 10 D cod-liver oil, 2 per cent of viosterol diluted to cod-liver oil potency, 2 per cent of 250 D viosterol, and 1 c c of 10,000 D viosterol.

The percentage hatchability over a 6-months period was 16.7±1.8, 49.2±1.3, 43.6±1.3, 23.3±1.9, 68.3±1.1, and 13.2±1.5, respectively. The total egg pro-

duction for 6 months was 388, 838, 929, 460, 1,197, and 384 in the respective lots, but the record for lot 6 was for 10 hens only. These results show that vitamin D is an important factor in both hatchability and egg production, and that viosterol is not as efficient as cod-liver oil in these respects. The hens in this study exhibited a high resistance to overdosage of vitamin D.

The relationship of skull measurements to cycle and egg production, D. R. MARBLE (*Poultry Sci., 11 (1932), No. 5, pp. 272–278, figs. 2*).—A study of a group of 100 White Leghorns and another group of 47 Barred Plymouth Rocks was undertaken at the Pennsylvania Experiment Station to determine whether there was any correlation between head type and production. A total of 6 length, 2 depth, and 6 width measurements of the skull of each bird was made. These measurements and ratios of the measurements were correlated with 365-day egg production during the pullet year and with the mean length of cycle for the first laying year.

The correlation analyses showed no consistent relationship for any of the factors under observation during the first laying year.

The influence of sex on the size and composition of tibiae of growing chicks, A. D. HOLMES, M. G. PIGGOTT, and W. B. MOORE (*Poultry Sci., 11 (1932), No. 4, pp. 243–249, figs. 3*).—For this study the authors divided day-old Rhode Island Red chicks into 14 lots of 50 birds each. All lots were housed and fed in an identical manner. Groups of 3 male and 3 female chicks were selected from each lot when the birds were 3, 6, and 9 weeks of age. These chicks were killed and the left tibiae promptly dissected. The tibiae were dried, measured, weighed, ashed, and analyzed for their calcium and phosphorus content according to sex and age.

It was found that the tibiae of the male chicks were generally longer, of greater diameter, and heavier than those from the corresponding female chicks. At 3 weeks of age the ash, calcium, and phosphorus content of the tibiae of males slightly exceeded that of females, but at 6 weeks of age these analyses were definitely in favor of the female chicks and at 9 weeks the difference had become more pronounced in favor of the female chicks. The authors suggest that the relative increased mineral content of the tibiae of female chicks may be associated with future reproductive demands.

Why some hens lay more eggs than others, H. E. ALDER (*Nebraska Sta. Circ. 44 (1932), pp. 7, figs. 6*).—In this circular the author discusses the genetical and management factors that are necessary for good egg production. The genetical factors discussed are intensity, good rhythm, persistency, early maturity, vitality, vigor, and lack of pauses. The management factors included hatching and raising young stock, nature of feed, feeding practices, housing, and disease control.

Some observations on fertility in White Wyandottes, W. L. S. HINDHAUGH (*Harper Adams Util. Poultry Jour., 17 (1931–32), No. 11, pp. 555–560*).—Findings available from statistical material obtained on the problem of fertility in White Wyandottes covering a period of 9 years are presented in this paper from the National Poultry Institute, England.

It is shown that the figure for the average fertility of a mating tends to obscure actual facts. When the birds observed were grouped according to their percentage fertility it was found that 54.3 per cent showed fertilities over 85, 10 per cent were under 5, and 35.8 per cent varied from 5 to 85. There was no evidence to indicate that fertility was lower in yearling hens than with pullets. Similar results were observed with the males whose records were examined. There was no evidence of regular seasonal variation in fertility, and the effect of adverse weather conditions could be overcome by good

management. It was found that the first two weeks of the incubation period was a good indicator of the fertility of females.

Pellets versus mash for table duck production, V. K. TALLENT (*Harper Adams Util. Poultry Jour., 17 (1931–32), No. 11, pp. 539–543*).—In studies at the National Institute of Poultry Husbandry, England, ducklings were divided into groups, each fed a ration made up of the same ingredients, but in one lot given feed in the form of pellets and in the other lot in the form of a wet mash. For the first five weeks of the test it was necessary to dampen the pellets before the ducklings would consume them.

The mash-fed ducklings attained a slightly greater final weight than the pellet-fed ducklings. The feed consumption and cost were practically the same in both lots. It had been believed that feeding the pellets would save time and labor as compared with feeding the wet mash, but the fact that the pellets had to be moistened for five weeks, that ducklings fed pellets consumed about twice as much water, and the slightly higher price of the pellets offset the advantages claimed for them.

The sexing of ducklings, V. K. TALLENT (*Harper Adams Util. Poultry Jour. 17 (1931–32), No. 11, pp. 553, 554, figs. 3*).—In this article from the National Institute of Poultry Husbandry, England, the author discusses a method for determining the sex of ducklings when they are a few days old.

How to raise turkeys successfully, also guineas, peafowl, and pheasants, H. M. LAMON and J. W. KINGHORNE (*Washington, D. C.: Authors, 1932, pp. 138, figs. 31*).—This treatise was prepared to give the latest available information on mating, breeding, hatching, brooding, rearing, feeding, and combating diseases and parasites of turkeys. Information is also given on the preparation for market and marketing of turkeys. Corresponding chapters are included on guineas, peafowls, and pheasants.

DAIRY FARMING—DAIRYING

[Experiments with dairy cattle and dairy products] (*Arkansas Sta. Bul. 280 (1932), pp. 39, 40*).—In this report data are presented covering studies on the value of alfalfa hay for dairy heifers during growth and lactation and the use of hypochlorites as deodorants in the manufacture of butter, by C. O. Jacobson, and analyses of butterfat, by M. S. Libbert.

[Experiments with dairy cattle and dairy products] (*Illinois Sta. Rpt. 1932, pp. 112, 113, 114–126, figs. 5*).—The studies with dairy cattle include data on an improved method for measuring the worth of sires, by W. W. Yapp; the feeding value and yields of soybean hay cut at different stages, by W. B. Nevens; new correlation formulas for simplifying studies of milk yields, and a study of a new phase of persistency of lactation, both by W. L. Gaines; and variations in milk energy formulas for dairy breeds, by O. R. Overman and Gaines.

Studies on milk and dairy products include the buying of cream by grade, by C. A. Brown; improving the whipping properties of cream, by P. H. Tracy and R. J. Ramsey; the size of fat globules in milk, by M. H. Campbell and Yapp; a direct method of counting bacteria in milk, and sodium hydroxide as a sterilizing agent, both by M. J. Prucha; and the superior food value of some evaporated milks over whole milk, by Nevens and D. D. Shaw.

[Investigations with dairy cows and dairy products in Oklahoma] (*Oklahoma Sta. [Bien.] Rpt. 1931–32, pp. 146–175, figs. 3*).—The experiments with dairy cattle included results of studies on the use of cottonseed meal in dairy rations and calf feeding (including vitamin deficiencies), by A. H. Kuhlman,

E. Weaver, and W. D. Gallup; the inadequacy of native pastures for milk production, mangels v. corn silage for milk cows, the use of mung bean hay in the ration for milking cows, growth and development of dairy calves, protection of dairy cattle from flies, and grading up scrub cows by the continued use of purebred bulls, by Kuhlman, P. C. McGilliard, and Weaver.

Data are reported from studies on improving the quality of Oklahoma butter, the place of the cheese manufacturing industry in Oklahoma, and ionic equilibria in ice cream mixes (including a test to detect neutralized cream and a method for keeping cocoa in suspension in chocolate milk), by E. L. Fouts, J. I. Keith, and Weaver; sweet curd cottage cheese, by Keith and Fouts; and the effect of cottonseed meal on dairy products, by Keith, Kuhlman, Weaver, and Gallup.

Feeding alfalfa and timothy hays to dairy cows, C. W. Holdaway, W. B. Ellett, J. F. Eheart, and H. G. Cunningham, jr. (*Virginia Sta. Tech. Bul. 45 (1932), pp. 27, fig. 1*).—Continuing this study (E. S. R., 66, p. 567), little difference was found in the digestion coefficients of the protein of a ration composed of alfalfa hay and grain and those of a ration of timothy hay with a grain mixture to which enough protein had been added to balance the protein of the alfalfa ration. The amounts of total nutrients digested by the cows were practically the same so far as requirements were concerned. Under the conditions of this test there was a marked difference in favor of the alfalfa ration.

During the first three months of lactation the average number of kilograms of milk produced per therm of energy was 2.6 and of butterfat 0.08 for the alfalfa ration and 2.2 and 0.07, respectively, for the timothy ration. During the fourth to ninth months the production was 1.9 and 0.06 kg of milk and butterfat, respectively, for the alfalfa ration and 1.6 and 0.05 kg for the timothy ration. Calculating the yields to a uniform net energy basis, the timothy ration produced 84 per cent as much milk and 83 per cent as much butterfat as the alfalfa ration during the first three months and 88 and 90 per cent, respectively, during the fourth to ninth months. A period of from 2 to 2.5 months was required to overcome the effects of the timothy ration when changes were made in feeding from timothy to alfalfa. Losses in live weight during the first three months of lactation were 15 kg more for the alfalfa than for the timothy ration, indicating that alfalfa stimulated milk production more than timothy. The net energy efficiency factors for milk production were lowest during the latter part of the lactation periods.

Digestion trials were conducted during the first three months and during the fourth to ninth months of each lactation. The average daily intake of calcium and phosphorus was 170.2 and 80.9 gm, respectively, for the alfalfa ration and 66.5 and 62.7 gm for the timothy ration. During the first three months none of the cows on timothy showed negative balances of calcium, but one cow on alfalfa was in such a state. However, the average body gains of calcium were 111.8 gm per cow for the 5-day digestion trial on the alfalfa ration and 71.1 gm on the timothy ration. During the fourth to ninth months all of the cows fed alfalfa gained calcium, but two of the cows on timothy were in negative calcium balance, probably due to low feed intake. While the alfalfa ration contained slightly more phosphorus than the timothy ration during the first three months, the cows on alfalfa showed larger negative balances than those on timothy. However, during the period from the fourth to the ninth months the cows on alfalfa retained more phosphorus for milk production and body reserves than they did during the early period. The data indicate that cows producing large quantities of milk for long periods showed

negative balances of calcium during the early part of lactation and probably for the greater part of the succeeding six months, and also showed that serious negative balances of phosphorus may be expected during this period. With such cows positive calcium balances were to be expected when the milk flow declined, but with prolonged high milk production by the forced feeding of low-phosphorus feeds and allowing the cows to remain unbred would continue to deplete phosphorus to a serious stage.

The digestibility of artificially dried grass, J. A. Newlander and C. H. Jones (*Vermont Sta. Bul. 348 (1932), pp. 20*).—Using the reversal method, two pairs of cows were fed through 2-week collection periods on rations consisting solely of artificially dried young grass or fresh green grass. Both feeds were highly digestible and were essentially equal in this respect. On the basis of 90.2 per cent of dry matter the total digestible nutrient content of green grass was 63.4 per cent and of dried grass, 64.4 per cent.

In digestibility the dry matter, crude protein, and nitrogen-free extract of a ration of timothy hay, corn silage, and dried grass and of a ration of timothy hay, corn silage, and grain were quite similar, but there was a marked difference in the digestibility of the crude fiber and ether extract. The crude fiber of the grain ration was 16.7 per cent less digestible than that of the dried grass ration, while the ether extract of the grass ration was 30.1 per cent less digestible than that of the grain ration. Mineral balances of calcium and phosphorus showed no indications of greater availability of these elements in the grass rations than in the grain rations.

The effect of feeding irradiated ergosterol to cows on the vitamin D content of milk, W. E. Krauss, R. M. Bethke, and C. F. Monroe (*Jour. Nutrition, 5 (1932), No. 5, pp. 467–477*).—This study was undertaken at the Ohio Experiment Station to determine whether a method could be devised for increasing the vitamin D content of cow's milk through the feeding of irradiated ergosterol. Two Holstein cows were fed various amounts of irradiated ergosterol dissolved in corn oil over 3-week periods. The vitamin D content of samples of butterfat collected during each period was determined biologically by both the curative and prophylactic methods and compared with samples obtained when the cows were receiving corn oil without ergosterol.

The antirachitic potency of the butterfat increased from 0.17 Steenbock rat units per gram to 2.5 units per gram as the rat units of vitamin D fed increased from the control period to 200,000 rat units in the ration. Evidence is given, however, which shows that the vitamin D of cod-liver oil is more efficient for calcification in chicks than that contained in butterfat from cows fed irradiated ergosterol. The practicability of this method of increasing the vitamin D content of milk is discussed.

The influence of different levels of fat intake upon milk secretion, L. A. Maynard and C. M. McCay (*New York Cornell Sta. Bul. 543 (1932), pp. 40, figs. 20*).—Continuing this study (E. S. R., 66, p. 662), involving a total of 19 cows, it was found that removing all but 1 per cent of the fat of a grain mixture containing approximately from 6 to 7 per cent of fat by benzine extraction and replacing it with an equal amount of isodynamic starch resulted in large decreases in milk and fat yields. When the fat content of the ration was reduced to 3 per cent, smaller but significant decreases resulted in the milk and fat yields. The effect of this procedure on the percentage of fat was variable, but there was no evidence that it was lowered by the reduced fat intake. Substituting starch for fat changed the quality of the secreted fat by increasing its iodine number. An analysis of the blood plasma showed a gradual lowering of the total fatty acids, phospholipid fatty acids, and cholesterol

accompanying the lowered fat intake. These changes in the lipids showed a high degree of parallelism. The glucose values for the whole blood, cells, and plasma were unaffected by the changes in the fat content of the ration.

Fat metabolism in the lactating goat, R. C. Bender and L. A. Maynard (*Jour. Dairy Sci., 15 (1932), No. 3, pp. 242–253, figs. 5*).—In a study at the New York Cornell Experiment Station lactating goats were fed a basal grain mixture in which the fat had been replaced by either starch or an oil. For the roughage portion of the ration a combination of ingredients of minimum fat content was used.

The results show that in four out of five cases the feeding of a ration containing a large amount of protein and total digestible nutrients but only 0.45 per cent of ether extract caused a decrease of from 25 to 55 per cent of milk yields and from 35 to 70 per cent in fat yields for periods of from 15 to 40 days' duration. In the fifth case the low-fat ration was fed for 15 days immediately after freshening and had no depressing effect on yields. With three animals the substitution of linseed oil or coconut oil for an equicaloric amount of starch in a low-fat ration stopped the downward trends in milk and fat yields, and small increases in either milk or fat yields followed. With the animal which had shown no decrease in yield on the low-fat ration, the substitution of linseed oil had no effect on milk yield but caused a slight rise in yield of fat. These results indicate that at least one of the causes of lowered yields on the low-fat ration was a lack of fat per se, but this point requires further study.

When coconut oil was fed with the basal ration, the fats produced were much more saturated and lower in molecular weight than when a 7 per cent fat or a linseed oil ration was fed. The curves for iodine number and saponification number showed an inverse relation throughout as the animals were shifted from one ration to another. These changes in the constants occurred sharply in a manner to indicate that with a ration adequate in total digestible nutrients the secretion of fat occurs with little intervention from the fat depots.

Periodic studies of the blood lipids showed that in all cases the curves for total lipids, phospholipids, and cholesterol had a marked parallelism as the values rose and fell under the influence of various diets, indicating a close metabolic relationship.

[Dairy investigations] (*New York State Sta. Rpt. 1932, pp. 23, 25, 26*).—This report contains preliminary results of studies on the growth of heat-loving and heat-resistant bacteria during high temperature pasteurization, the efficiency of a high-temperature short-time pasteurizer of the hot water type, and bacterial and chemical phases of cheese manufacture.

The judging of dairy products, C. A. Phillips and F. H. Abbott (*California Sta. Circ. 327 (1932), pp. 42, figs. 18*).—This circular presents score cards and instructions for judging milk, butter, cheese, and ice cream. These instructions are intended primarily for students' use and contain information regarding the cause and methods of determining defects. Appended are rules for college students' contests in judging dairy products.

A factor in Swiss cheese quality, R. E. Hardell (*Amer. Creamery and Poultry Prod. Rev., 74 (1932), No. 7, pp. 244, 245*).—In cooperation with cheese factories the U. S. D. A. Bureau of Dairy Industry made a study of the effect of different starters on the quality of Swiss cheese. It was found that the use of a pure culture of *Lactobacillus bulgaricus* in sterilized milk or whey did not prevent dead eyes, defective body and texture, or so-called "stinkers." Adding to the pure culture a raw whey starter which contained streptococci that had a high thermal death point and which had been incubated at approx-

mately 30° C. produced a cheese with better body and texture and of a higher grade. A starter containing active streptococci aided in firming the curd in the kettle, while the pure culture did not have this effect. Milk infected with streptococci that would survive the cooking temperatures in the cheese kettle appeared to be more adaptable to the manufacture of Swiss cheese when a pure culture of Gere A was being used as the starter.

The manufacture of cottage cheese involving the use of dry skim milk, W. H. E. Reid and C. L. Fleshman (*Amer. Creamery and Poultry Prod. Rev., 74 (1932), No. 15, pp. 534, 536, 538*).—In this article from the Missouri Experiment Station the author describes a method for using dried skim milk in the manufacture of cottage cheese.

Action of an aerobic spore-forming organism on evaporated milk, B. W. Hammer and R. V. Hussong (*Jour. Dairy Sci., 15 (1932), No. 3, pp. 220–229, fig. 1*).—The Iowa Experiment Station undertook a study of the cause of an outbreak of coagulation in evaporated milk. An organism identified as *Bacillus cereus* was isolated from three cans, all of which came from one batch of milk. It curdled cans of milk slowly at 37° C., without change in odor or flavor of the milk unless the incubation period was extended, but it could be found microscopically for only a short time after inoculation into cans and then only in small numbers. When inoculated evaporated milk was given a sufficient supply of air the organism curdled the milk rapidly, brought about an objectionable odor and flavor, and could be found in large numbers microscopically. Under extended incubation at 37° normal cans of evaporated milk showed partial curdling, an increase in color, and a change in odor and flavor.

Since the organism was found in only three cans it did not appear to be the primary cause of the outbreak of coagulation. Evidence that this was true came from the fact that the organism survived in inoculated milk at 37° for extended periods, and that there was an increase in the soluble and amino nitrogen in evaporated milk that coagulated following inoculation while these compounds in the milk studied were the same as in normal evaporated milk.

Relation of temperature of ice cream to the distribution of certain of its components between the liquid and solid phases, W. C. Cole (*Jour. Dairy Sci., 15 (1932), No. 3, pp. 254–265, figs. 4*).—At the California Experiment Station attempts were made to separate the liquid phase of ice cream from its solid phase by applying centrifugal force or by the use of a pressure filter. It was found that the changes which occur in the freezing of ice cream are chiefly concerned with the distribution of moisture between the liquid and solid phases. A study of the cooling and melting curves of ice cream indicated that the temperature range at which maximum ice crystallization occurred was just below the freezing point of the mix. The results of the application of a filtering process to ice cream over a wide range of temperatures substantiated these observations.

The value of these observations in relation to the influence of methods of freezing upon texture under commercial conditions are discussed, and an explanation is presented for the improvement in texture accompanying low drawing temperatures.

Useful milk products and milk preparations, L. Gershenfeld (*Amer. Jour. Pharm., 104 (1932), No. 8, pp. 540–574, fig. 1*).—This is a compilation of information on the public health aspects of the distribution of milk products and on the manufacture, composition, and consumption in the United States of various milk products, including condensed, evaporated, powdered, and malted milks, ice cream, special milk beverages (such as buttermilk, kefir, kumiss,

Bulgarian buttermilk, and acidophilus milk), casein, sugar of milk, cream, butter, cheese, and reconstructed milk.

Beta lactose: A new by-product of milk, P. F. Sharp (*Amer. Creamery and Poultry Prod. Rev., 74 (1932), No. 8, pp. 286, 288, 289*).—In this article from the New York Cornell Experiment Station, the author describes the benefits derived and the causes of these favorable effects resulting from the use of beta lactose in the diet. The marketing aspects of this new by-product are also discussed.

VETERINARY MEDICINE

Veterinary pathology and bacteriology, S. H. Gaiger and G. O. Davies (*London: Baillière, Tindall & Cox, 1932, pp. VIII+610, figs. 194.*)—Part 1 of this work deals with general pathology (pp. 1–84), part 2 with the bacteriology and pathology of infectious diseases (pp. 85–402), and part 3 with special pathology of organic diseases (pp. 403–544). An appendix dealing with technic is included (pp. 545–580).

Textbook of helminthology, C. E. W. Sprehn (*Lehrbuch der Helminthologie. Berlin: Borntraeger Bros., 1932, pp. XVI+998, figs. 374*).—A natural history of the helminth parasites of the mammalian and avian fauna of Germany, with particular consideration of the helminths of man and the domestic and more important useful animals. Part 1 (pp. 3–176) is devoted to the general and part 2 (pp. 177–801) to the special natural history of helminths, the arrangement being by classes and families. A host list (pp. 802–892), an index to the genera and species and their synonymy (pp. 893–941), and a bibliography (pp. 942–996) are included.

[Work with diseases of livestock] (*Illinois Sta. Rpt. 1932, pp. 84, 85, 101–103, 103–106, 109–111, figs. 5*).—The work referred to (E. S. R., 66, p. 270), by R. Graham, F. Thorp, jr., E. H. Barger, J. P. Torrey, V. M. Michael, E. Roberts, and L. E. Card, includes that with infectious abortion, botflies and other internal pests of horses and mules, simplified incubator fumigation and methods of testing in control work with and heredity of resistance to pullorum disease, sanitation in the control of laryngotracheitis in the fowl, and outbreaks of pox in pigeons.

Annual report of the deputy director (animal industry) and chief veterinary officer for 1931, H. H. Brassey-Edwards (*Kenya Colony Dept. Agr. Ann. Rpt. 1931, pp. 213–287*).—Accounts of the occurrence of and control work with infectious diseases of livestock, including ticks and tick-borne diseases, are included in this report.

Annual report of the chief veterinary research officer for the year 1931, J. Walker (*Kenya Colony Dept. Agr. Ann. Rpt. 1931, pp. 288–314*).—The research work reported upon deals particularly with East Coast fever and rinderpest.

Government of Northern Rhodesia, Department of Animal Health, annual report for the year 1931, J. Smith, J. P. A. Morris, and R. A. S. Macdonald (*North. Rhodesia Dept. Anim. Health Ann. Rpt. 1931, pp. 44, fig. 1*).—Included in this report (E. S. R., 66, p. 666) are accounts of the occurrence of and control work with infectious and parasitic diseases of livestock and a brief report of research work conducted. Catches of insects in flytrap from March 4 to April 2, 1931 (p. 30), a list of flies collected at Bombwe by the assistant veterinary research officer (p. 31), a list of helminths collected from mammals and birds in the Mazabuka area, Northern Rhodesia (pp. 31–34), a list of plants drenched to cattle and sheep, with note on toxicity (pp. 39–41), etc., are included in the several appendixes.

[Contributions on animal pathology] (*North. Rhodesia Dept. Anim. Health Ann. Bul., 1931, pp. 9–37, 40–44*).—The contributions here presented include the following: Notes on the More Important Worms of Cattle, Sheep, and Pigs in Northern Rhodesia, by P. L. le Roux (pp. 9–24); Trypanosomiasis: Some Experiences Gained in the Fort Jameson District, by G. F. Elliott (pp. 25–28); Plant Poisoning in Cattle and Sheep in Northern Rhodesia, by R. A. S. Macdonald and P. L. le Roux (pp. 29–37); Heartwater, by E. H. Brogan (pp. 40–42); and Inoculation against Redwater and Gallsickness, by R. A. S. Macdonald and P. L. le Roux (pp. 43, 44).

Annual report of the department of veterinary science and animal husbandry for the year ending 31st December, 1931, H. E. Hornby et al. (*Tanganyika Ter. Dept. Vet. Sci. and Anim. Husb. Ann. Rpt. 1931, pp.* [2]+*59*).—This report (E. S. R., 66, p. 866) includes an account of disease control work with infectious diseases and plant poisoning (pp. 1–8) and of research work at the veterinary laboratory at Mpwapwa (pp. 9–46), particularly trypanosomiasis and rinderpest.

Annual report of the veterinary department for the year ended 31st December, 1931, W. F. Poulton et al. (*Uganda Vet. Dept. Ann. Rpt. 1931, pp. 23*).—In this report, dealing with the occurrence of and control work with diseases of livestock (E. S. R., 66, p. 467), particular attention is given to rinderpest, which occurred in 9 of the 18 districts in the Protectorate during 1931. Adequate control is said to have been obtained in the majority of cases, eradication having been effected before serious spread and marked mortality resulted.

Annual report of the veterinary department for the year 1931, F. J. Sheedy (*Fed. Malay States Vet. Dept. Ann. Rpt. 1931, pp. 15*).—Of the infectious diseases of livestock here dealt with, particular attention is given to rinderpest as it appeared in the State of Selangor, the source of which was not definitely traced.

Annual report of the veterinary department for the year 1931, F. J. Sheedy (*Straits Settlements Vet. Dept. Ann. Rpt. 1931, pp. 10*).—Accounts of the occurrence of and control work with the infectious diseases of livestock are included in this report.

Animal health investigations, G. A. Julius et al. (*Aust. Council Sci. and Indus. Res. Ann. Rpt., 5 (1930–31), pp. 21–24*).—This report deals with the more important infectious diseases of livestock met with during the year.

The pathogenicity of the saprophytic acid-fast bacilli, W. A. Hagan and P. Levine (*Jour. Amer. Vet. Med. Assoc., 81 (1932), No. 6, pp. 723–733, figs. 2*).—A contribution presented at the annual meeting of the American Veterinary Medical Association held in Atlanta, Ga., in 1932.

Bang's disease in the Yellowstone National Park buffalo and elk herds, W. M. Rush (*Jour. Mammal., 13 (1932), No. 4, pp. 371, 372*).—Blood samples taken at the time of butchering the surplus buffalo in the Yellowstone National Park in December, 1931, were given the rapid plate test, 58 of 110 tested reacting positively and 25 samples being suspicious. Of 32 blood samples taken from elk ranging in proximity to the buffalo range, 3 were positive, 8 suspicious, and 21 negative.

Blackleg aggressin immunization, J. Reichel and J. E. Schneider (*Jour. Amer. Vet. Med. Assoc., 81 (1932), No. 6, pp. 768–775*).—The authors report upon an animal protection test that has been worked out for establishing the potency of a test dose of blackleg aggressin. "In the development of the animal protection test it has been shown that a definite dose of a potent product will protect 66 per cent or more of the treated animals, while 66 per cent or more of

the controls will die of blackleg. The animal protection test described will permit of the potency standardization of blackleg aggressin."

Longevity of the virus of boutonneuse fever (Rickettsia conori n. sp.) in the tick Rhipicephalus sanguineus [trans. title], E. BRUMPT (*Compt. Rend. Soc. Biol. [Paris], 110 (1932), No. 28, pp. 1199–1202*).—The author here describes the virus of boutonneuse fever, transmitted by the brown dog tick, under the name *R. conori* n. sp., and reports upon observations of its longevity in this tick. It has been found that the virus can survive without the vertebrate host for more than a year and a half.

On the hereditary transmission of the virus of boutonneuse fever, or exanthematous fever of Marseille, in the tick Rhipicephalus sanguineus [trans. title], D. COMBIESCO and G. ZOTTA (*Compt. Rend. Soc. Biol. [Paris], 110 (1932), No. 28, pp. 1223, 1224*).—The authors report having found the virus of exanthematous fever to pass through the eggs of infected ticks, thus confirming the finding of Blanc and Caminopetros (E. S. R., 67, p. 741).

The control of foot-and-mouth disease by iodine, F. WARE and P. C. BANERJI (*Indian Jour. Vet. Sci. and Anim. Husb., 2 (1932), No. 2, pp. 103–130*).—Field tests under controlled conditions at the Muktesar Institute on five occasions during the past few years, the details of which are given in tabular form, failed to substantiate the claims regarding the control of outbreaks of foot-and-mouth disease by the intravenous injection of iodine. In two outbreaks there was some evidence to show that the symptoms were rendered less severe by the use of iodine, but the development of lesions was not arrested. It is considered that there is no justification for the use of iodine in this disease other than for its general tonic effects, since it appears to have no specific action on the virus, or at least not the type of virus responsible for the natural outbreaks of this disease in the Kumaon hills.

Value of systemic alkalinization in influenzal types of disease, R. W. HIXSON (*Jour. Amer. Vet. Med. Assoc., 81 (1932), No. 6, pp. 776–789*).—More than 4,500 cases of bovine shipping fever were treated by the author with intravenous and intraperitoneal injections of sodium bicarbonate solutions of variable strength, with the result that losses were reduced from 3 to 20 per cent to less than 1 per cent. Two thousand c c of an 8 per cent solution administered intravenously is said to be most effective.

Studies on mastitis (*New York State Sta. Rpt. 1932, pp. 19–21*).—A brief statement of the work under way with mastitis in dairy herds, detailed accounts of which by Hucker et al. have been noted (E. S. R., 68, pp. 377, 530). Brief reference to the bacteriology of septic sore throat epidemics follows.

Rachitis in its etiological, biochemical, pathogenetical, patho-anatomical, and clinical aspects: An experimental and comparative study, J. MAREK and O. WELLMANN. **Biochemical part,** O. WELLMANN (*Die Rhachitis in Ihren Ätiologischen, Biochemischen, Pathogenetischen, Pathologisch-anatomischen, und Klinischen Beziehungen: Eine Experimentelle und Vergleichende Studie. Biochemischer Teil. Jena: Gustav Fischer, 1932, pp. VII+480, figs. 12*).—In this biochemical part of the work previously noted (E. S. R., 67, p. 598), much of the data is presented in tabular form. An 11-page list of references to the literature is included.

The antigenic proteins of Salmonella aertrycke, F. J. O'HARA and M. E. TAYLOR (*Ind. Acad. Sci. Proc., 47 (1931), pp. 235–243*).—The authors found it possible to separate specific antigenic fractions from the whole bacterial protein of *S. aertrycke*. "The whole bacterial protein, under the experimental conditions of this work, was a more powerful antigen than any of the fractions tested. The antigenic fractions obtained corresponded to a mixture of albumin

and pseudoglobulin, albumin, a mixture of globulin and undetermined proteins, and conjugated proteins. Since tests for globulin and pseudoglobulin were negative, this indicates that there are present as antigens albumin, conjugated protein, and some other protein or proteins as yet undetermined."

The haemolytic streptococci: Their grouping by agglutination, F. W. ANDREWES and E. M. CHRISTIE ([*Gt. Brit.*] *Med. Res. Council, Spec. Rpt. Ser. No. 169 (1932), pp. 73, figs. 24*).—Following a brief introduction, the subject is dealt with under the headings of serological observations (preliminary studies), results of absorption experiments, and antigenic analysis of the hemolytic streptococci.

Tularemia in fur-bearing animals, F. VOLKMAR (*Amer. Fur Breeder, 5 (1932), Nos. 4, pp. 11–13; 5, pp. 26, 27*).—This is a summary of information presented in connection with a list of 25 references to the literature.

Tularemia from the ingestion of insufficiently cooked rabbit, M. CRAWFORD (*Jour. Amer. Med. Assoc., 99 (1932), No. 18, pp. 1497, 1498*).—An account is given of cases of tularemia resulting from consumption of an insufficiently cooked rabbit.

Immunologic studies on tularemia in rabbits, C. M. DOWNS (*Jour. Infect. Diseases, 51 (1932), No. 2, pp. 315–323*).—In experimental work it was found that "formaldehydized cultures of *P[asteurella] tularensis* produce a high degree of immunity in rabbits. This immunity is evidenced by delay of invasion of the blood stream by the organisms, the production of agglutinins in the blood stream, and the marked proliferative and localizing changes shown in the lesions in immune animals as contrasted with normal controls. This immunity develops slowly after from six to eight injections. Subcutaneous, intracutaneous, or intravenous methods seem equally effective."

Induction of avirulence in Pasteurella tularensis, L. FOSHAY (*Jour. Infect. Diseases, 51 (1932), No. 2, pp. 280–285*).—Evidence is here presented to show that two strains of *P. tularensis* from two fatal cases in man lost their virulence for certain laboratory animals as a result of prolonged cultivation on coagulated egg yolk at low temperature.

The similarity of pseudotuberculosis and tularemia, H. A. REIMANN and W. J. ROSE (*Arch. Path., 11 (1931), No. 4, pp. 584–588*).—Attention is drawn to the similarity between the granulomatous infection classed as pseudotuberculosis in Europe and tularemia.

Further studies on B. pseudotuberculosis, H. A. REIMANN (*Amer. Jour. Hyg., 16 (1932), No. 1, pp. 206–214, figs. 5*).—The author considers it desirable to abandon the term "pseudotuberculosis" for all conditions other than that associated with *Pasteurella* (*Bacillus*) *pseudotuberculosis rodentium* Pfeif. It is pointed out that the organisms causing plague, tularemia, and pseudotuberculosis are closely related and belong to the pasteurella group of bacteria.

The Brucella group, G. S. WILSON (*Bul. Hyg., 6 (1931), No. 5, pp. 389–394*).—A brief review of the present status of knowledge, presented in connection with a list of 34 references to the literature.

Antigenic qualities of a dissociated strain of Brucella abortus, R. GWATKIN (*Canad. Pub. Health Jour., 23 (1932), No. 10, pp. 485–492, figs. 2*).—In this contribution, which presents the results of some experimental work with one R strain of *B. abortus*, attention is called to the striking differences in some characteristics, such as antigenic power and virulence, and the apparent lack of change in others. A virulent strain of *B. abortus* was dissociated by growing in 10 per cent immune serum broth.

Efficacy of different strains of Brucella abortus as immunizing agents against infectious abortion, W. E. COTTON (*Jour. Agr. Res. [U. S.], 45 (1932),*

No. 12, pp. 705–724).—The author reports upon experiments conducted with the view to determining the efficacy of three strains of *B. abortus* as immunizing agents against infectious abortion. "The strains tested were an avirulent bovine strain, a virulent swine, and a virulent bovine strain. The results of these experiments indicate that the strain of bovine *B. abortus* avirulent for guinea pigs or the virulent swine strain, when administered to cows and heifers 3 to 5½ months before service, afforded only slight protection against repeated exposure to *B. abortus* as compared with that induced by the virulent bovine strain. When given after conception, the avirulent bovine strain seemed to increase resistance to the progress of the disease and the swine strain appeared to give a definite immunity. However, the latter strain is likely to infect the udder for long periods and hence its use for vaccinating cattle, because the swine strain of *B. abortus* is generally believed to be more dangerous to human health than the bovine, is out of the question. These findings throw light on the relation of swine strains of *B. abortus* bovine and show the danger of infecting the udder with a swine strain of *B. abortus* if it should, by accident, find its way into vaccine.

"Neither the avirulent bovine nor the virulent swine strain of vaccine, administered from 3 to 5½ months before breeding, produced much more than a slightly greater resistance to the long-continued severe exposure given than that possessed by the controls; nor did either of the vaccines prevent the udders from becoming infected. In one instance the swine strain of vaccine caused udder infection.

"A vaccine prepared from virulent bovine *B. abortus* afforded a marked resistance to abortion and uterine infection under the same conditions as those of the two previously mentioned strains, but either did not prevent udder infection or was the direct cause of it in half the animals that completed the experiment. Udder infection, however, was greater among the controls. The accidental use of this vaccine on a pregnant heifer caused her to abort."

It was found that *B. abortus* of the swine type, when used as a vaccine before conception, may invade the udder and associated lymph glands and persist there for at least 1⅓ years. If administered to pregnant cattle it may also invade the udder and persist there, without appreciable change in character, for at least 4 years.

Undulant fever of bovine origin due to Brucella melitensis [trans. title], M. Gilles, G. Pérès, and Culty (*Rev. Gén. Méd. Vét., 41 (1932), No. 488, pp. 476–480*).—It is pointed out that undulant fever of bovine origin is not always due to *B. abortus*. In southern France particularly a cow may be infected by *B. melitensis* and transmit it to man, as shown by the three cases here reported.

Some observations on the natural course of the Brucella agglutination reaction in a dairy herd over a four-year period, S. R. Damon (*Amer. Jour. Hyg., 16 (1932), No. 3, pp. 798–805*).—Findings in the study of a herd of purebred Holstein and Guernsey cattle varying in number from 225 to 250, in which blood tests for infectious abortion were made every 2 months for the first 2 years, every 4 months during the third year, and twice during the fourth year, are reported in tabular form.

A contribution to a study of malignant catarrhal fever of cattle [trans. title], A. Colson (*Arch. Insts. Pasteur Indochine, No. 13 (1931), pp. 3–72, figs. 4*).—An account of malignant catarrhal fever, which occurs widespread in the five States of French Indochina and is confined exclusively to the ox and buffalo.

Ergotism of cattle in Kansas, J. W. Lumb (*Jour. Amer. Vet. Med. Assoc., 81 (1932), No. 6, pp. 812–816, figs. 2*).—A brief account of cases of ergotism met with in Kansas.

An intradermal test for detecting Johne's disease of cattle, A. Boerman and A. E. Fogle (*Jour. Amer. Vet. Med. Assoc., 81 (1932), No. 6, pp. 795–808*).—The results obtained by the Ohio Experiment Station and the Ohio Department of Agriculture, cooperating in work with the intradermal johnin test, indicate that it is as valuable as the intravenous test in detecting Johne's disease in cattle. When both the intradermal and intravenous tests were used, the results more nearly agreed with the post-mortem findings than if either test were used alone.

Studies on bovine mastitis.—VII, The serological characters of mastitis streptococci, A. W. Stableforth (*Jour. Compar. Path. and Ther., 45 (1932), No. 3, pp. 185–211*).—This contribution is in continuation of those previously noted (E. S. R., 67, p. 599).

It was found that "each of the Groups I, II, and III into which streptococci from cases of bovine mastitis can be arranged on cultural and biochemical grounds can be further divided by means of serological methods. The methods used were precipitation at 50 to 55° C., using extracts prepared with hot M/20 HCl in saline, agglutination by means of a rapid macroscopic slide technic at room temperature, and the corresponding absorption tests.

"Immune sera were rendered type-specific by means of preliminary absorption. The precipitation test was applicable to all types of streptococci examined except those of Group III, which appeared to be deficient in type-specific protein. The slide agglutination technic gave easily read and reproducible results, and by the methods described both direct agglutination and agglutinin-absorption tests were carried out quickly with minimal amounts of serum and suspension. Suspensions which were not sufficiently stable for tube agglutination tests at higher temperatures were in general satisfactory for the slide test. A few strains always gave very granular suspensions and could only be dealt with by agglutinin-absorption or by precipitation. Except in the case of Group III, the results obtained by precipitation and agglutination were parallel. In group II, however, certain minor differences were observed.

"One hundred and sixty strains from different quarters of 151 animals have been examined and among these 9 serological types have been recognized; 110 strains were from clinical cases of mastitis."

The etiology of bovine nasal granuloma, S. C. A. Datta (*Indian Jour. Vet. Sci. and Anim. Husb., 2 (1932), No. 2, pp. 131–140, pls. 4*).—It is pointed out that a few cases of rhinosporidiosis of cattle have been reported in India, but that the bovine nasal granuloma proper differs in being a schistosomiasis. "Nasal granuloma presents an altogether new localization of schistosomiasis, as compared with the hitherto known urinary and intestinal forms. The parasite resembles *Schistosoma spindalis* Montgomery, but certain differences, which are under study, have been observed. The true nature of the 'granules' previously described in this condition has been shown to be closely connected with the invading parasite, which sets up reactions resulting in the formation of the so-called follicles and actinobodies. Examination of nasal discharges in caustic potash preparations should be of great value in the diagnosis of the disease in future. With the definite information now available regarding the etiology of this condition, further experiments with the intravenous administration of such drugs as tartar emetic, emetine, antimosan, etc., are indicated."

The curative treatment of bovine pleuropneumonia by administration of neosalvarsan [trans. title], G. Curasson (*Bul. Acad. Vét. France, 5 (1932), No. 4, pp. 173–178*).—The author concludes from the work here reported that neosalvarsan (novarsenobenzol, neoarsphenamine) may be considered a specific in the treatment of contagious pleuropneumonia, although it does not cure severe cases with lesions in both lungs.

Experimental and natural Streptococcus hemolyticus infection of the udder of the cow, E. S. Robinson and J. A. McComb (*Jour. Infect. Diseases, 51 (1932), No. 2, pp. 292–297*).—An attempt was made, using a cow naturally infected in two quarters with *S. epidemicus*, to infect another quarter with *S. hemolyticus* through injection into the lumen of the milk canal. It is thought that the failure that resulted may have been due possibly to the small size of the infecting dose or to the low virulence of the organism. A similar attempt with a second cow which had suffered from mastitis due to *S. hemolyticus* failed, but succeeded when a larger dose of the same organism was injected. This infection persisted in the quarter experimentally infected through a nonlactating period, remained present for about six weeks following calving, and then spontaneously disappeared. An attempt to reinfect this same quarter was successful, although infection persisted for only about a month and then again spontaneously disappeared.

The streptococcic infections of the udder, particularly the so-called gelbe galt, M. Seelemann (*Die Streptokokken-infektionen des Euters, insbesondere der Gelbe Galt. Hannover: M. & H. Schaper, 1932, pp. VII+259, figs. [28]; rev. in Jour. Compar. Path. and Ther., 45 (1932), No. 2, p. 176, 177; Jour. Amer. Vet. Med. Assoc., 81 (1932), No. 2, p. 261*).—In this monographic account, which includes the results of investigations conducted in Schleswig-Holstein from 1926 to 1931, part 1 is devoted to a historical discussion (pp. 1, 2), part 2 deals with the occurrence and distribution of a mastitis known as gelbe galt characterized by a yellowish discharge and due to *Streptococcus agalactiae* [= *S. mastitidis*] (pp. 2–9), part 3 with the injury and economic importance of the affection (pp. 9–28), part 4 with its causes (pp. 29–53), part 5 manner of infection and transmssiion of the streptococci (pp. 53–76), part 6 technic and methods of milk examination (pp. 77–128), part 7 bacteriology of streptococcic infections of the udder (pp. 128–153), part 8 natural course of the disease (pp. 154–209), part 9 its treatment and prevention (pp. 209–249), and part 10 conclusions (p. 249). A list of 219 references to the literature is included. Although it is recognized that mastitis in the cow is caused by different microorganisms, the prevalent type is considered to be that which can be traced in the literature in Switzerland and Germany under the name gelbe galt.

The toxicity of carbon tetrachloride for sheep and cattle: A survey, A. L. Rose (*Aust. Vet. Jour., 8 (1932), No. 4, pp. 122–137*).—In this contribution the author draws attention to the varying conditions under which carbon tetrachloride has proved to be toxic when administered to sheep under field conditions in New South Wales.

[Sheep losses in Colorado], I. E. Newsom (*Colorado Sta. Rpt. 1932, pp. 57, 58*).—A brief statement is made of sheep losses in the feed lots from coccidiosis, death losses in lambs on heavy grain feed, and blackleg caused by shearing wounds.

Infectious abortion of sheep.—Preliminary report, W. L. Hindmarsh and C. C. Blumer (*Aust. Vet. Jour., 8 (1932), No. 4, pp. 149–151*).—Thirty of 120 ewes that aborted in a flock of 4,000 died of septic metritis. A diphtheroid bacillus was cultivated from the uterus of one of the ewes which aborted. Infection of guinea pigs and a ewe with this organism was followed by premature birth and abortion.

Infectious abortion of sheep in Greece [trans. title], B. Ananiadés and N. Miaoulis (*Rev. Gén. Méd. Vét., 40 (1931), No. 480, pp. 721–726*).—The authors conclude from the results of serological and bacteriological studies that *Brucella abortus* has been the cause of epizootic abortion of sheep in Greece.

Gas gangrene infections of sheep: Passive immunisation, A. D. McEwen and R. S. Roberts (*Jour. Compar. Path. and Ther., 45 (1932), No. 3, pp.*

212–223).—The authors have found that the great majority of cases of gas gangrene of sheep on the Romney Marsh are caused by *B*[*acillus*] *chauvoei*, parturient ewes suffering more than other sheep. The use of immune serum in the field on cases when there is reason to suspect that a *B. chauvoei* infection may be or may have been acquired is considered to be warranted.

An epizootic of pneumoenteritis in sheep in Persia [trans. title], L. DELPY (*Rev. Gén. Méd. Vét., 41 (1932), No. 487, pp. 398–407*).—The epizootic here dealt with, which appeared in three clinical types, is said to have been due to a Pasteurella associated with an undetermined organism resembling the colon bacillus. A diagnosis could only be made in the laboratory, since the rapid course led to its confusion with anthrax. The serum from immunized sheep possessed curative properties permitting effective intervention even in grave cases. A vaccine consisting of cultures of the two organisms, devitalized with formol, arrested the outbreak.

Control of the bitterweed plant poisonous to sheep in the Edwards Plateau region, S. E. JONES, W. H. HILL, and T. A. BOND (*Texas Sta. Bul. 464 (1932), pp. 23, figs. 10*).—This is an account of control work with bitterweed, a report of studies of the toxicity of which for sheep has been noted (E. S. R., 66, p. 273), conducted in cooperation with the State Livestock Sanitary Commission.

In work commenced in the fall of 1931 it was found that hazard areas could be economically sprayed with 12 lbs. of calcium chlorate in 200 gal. of water per acre to kill the plant. This spray was effective during humid weather and most effective following rains, but did not kill the bitterweed during dry weather when the relative humidity averaged 59.5 per cent or less for a period of two weeks following the treatment. Sulfuric acid and petroleum oil sprays were ineffective. Burning the bitterweed proved to be ineffective and is a bad practice. Scattered plants may be economically pulled along roadways and ditches, and in small areas around headquarters and watering places.

Ten species of insects were found feeding on bitterweed, 4 of which were new to science. Of these, a weevil of the genus Brachytarsus whose grub feeds on the seed was of the most importance as an agent of control, about 20 per cent of the seed heads collected at 14 places in 11 counties having been destroyed in the winter of 1931–32.

It is thought that bitterweed can be eradicated in some places when weather conditions are favorable and insect damage is considerable, and provided conscientious effort is made for several years. Bitterweed seed may not all germinate in years when weather conditions are not favorable, but some remain viable for at least a year and develop into seedlings the second season. The stocking should be adjusted so as to reestablish a good grass turf, the seed-producing centers should be destroyed by spraying, and the remaining scattered plants pulled.

Types of Clostridium welchii found in dysentery of lambs, H. MARSH, E. A. TUNNICLIFF, and E. JUNGHERR (*Jour. Infect. Diseases, 51 (1932), No. 2, pp. 330–335*).—In work at the Montana Experiment Station, "*C. welchii* was isolated from the intestines of 33 of 34 very young lambs affected with fatal diarrhea in 11 outbreaks of the disease. *C. welchii* was isolated from the intestines of 9 normal lambs of comparable age obtained from 2 ranches where dysentery did not exist. *C. welchii* was present in milk from 1 ewe and absent in milk from 6 ewes, all of which had lost their lambs from dysentery. *C. welchii* was present in a culture from the surface of a ewe's teat. Twenty-one strains were studied in detail. All of these strains, except the Dalling bacillus, were either type 1 or type 2, according to Simonds' classification. None of the strains studied corresponded in the differential reactions to the variety of *C. welchii*

described by Dalling as the cause of the dysentery of lambs that occurs in England."

Studies with the strongyloid nematode Haemonchus contortus.—II, Potential infestation curves under conditions of natural reinfection, N. R. Stoll (*Amer. Jour. Hyg., 16 (1932), No. 3, pp. 783–797, figs. 3*).—In continuation of his studies of *H. contortus* (E. S. R., 62, p. 378), the author reports upon the results which followed exposure of two lambs to the stomach worm under conditions of natural reinfection. It was possible from the data available to develop curves of potential infestation, illustrating the enormous disproportion between the presumptive and actual infestations of animals under natural conditions of interplay between parasite and host.

Coccidia of the sheep and goat: The life cycle of Eimeria nina-kohl-yakimovi Yakimoff and Rastegaieva 1930 [trans. title], L. Balozet (*Arch. Inst. Pasteur Tunis, 21 (1932), No. 1, pp. 88–118, pls. 2*).—In the studies here reported, presented in connection with a list of 77 references to the literature, the author includes a table for the separation of five forms of Eimeria which affect the sheep and goat, namely, *E. intricata* Spiegl 1925, *E. arloingi* Marotel 1905, *E. parva* Kotlan, Mocsy, and Vajda 1929, *E. faurei* Moussu and Marotel 1901, and *E. nina-kohl-yakimovi* Yak. and Rasteg. 1930.

On Trichostrongylus pietersei sp. n., a parasite of sheep and goats, P. L. Leroux (*Ann. and Mag. Nat. Hist., 10. ser., 10 (1932), No. 59, pp. 502–504, figs. 2*).—A parasite collected from the gastrointestinal tract of two Blackhead Persian ewes which had died is described as new under the name *T. pietersei*. It has also been found to occur in merino sheep and Angora goats in the Union of South Africa.

Diseases of the pig, T. D. Marsh (*Malayan Agr. Jour., 20 (1932), No. 9, pp. 464–469*).—This is a digest of information on the diseases of swine in the Malay Peninsula, of which hog cholera is said to be the most dangerous.

Vaccination of swine against tuberculosis with Calmette-Guérin culture, B. C. G., F. M. Hayes, C. M. Haring, and J. Traum (*Hilgardia [California Sta.], 7 (1932), No. 6, pp. 235–261*).—Following a review of the literature relating to the use of B. C. G. as an immunizing agent for tuberculosis in swine, a description is given of the experimental methods used and the results of subcutaneous, intramuscular, intravenous, intradermal, and oral vaccination work, the details of which are presented in tabular form.

One injection of B. C. G. by subcutaneous, intramuscular, intradermal, or intravenous routes, or three treatments by mouth, failed to give swine sufficient protection against feeding and intravenous infection to prevent generalized tuberculosis. Slight resistance as compared to the controls was shown by certain groups vaccinated subcutaneously and infected by feeding. Those vaccinated subcutaneously showed slightly greater resistance against intravenous infection than against feeding exposure, as measured by clinical evidence. Those vaccinated by mouth showed a slightly greater susceptibility to feeding infection than the control to feeding infection. Swine over 6 months of age apparently had more natural resistance to feeding exposure than younger pigs. No important differences were noted in the extent of tuberculosis produced from 4, 5, 10, 20, and 30 feeding exposures. The B. C. G. culture used was capable of producing small lesions in swine which eventually healed at the points where the bacilli lodged after injection. No spread from these primary lesions was observed.

Studies on rough and smooth variants of Shigella equirulis (B. nephritidis-equi), P. R. Edwards (*Jour. Bact., 24 (1932), No. 4, pp. 283–298, pl. 1*).—This is a report upon the extensive variation found in the cultural characters

of *S. equirulis*, also known as *B[acterium] nephritidis equi* and *S. viscosa*, during the course of work at the Kentucky Experiment Station, an extended account of which has been noted (E. S. R., 66, p. 575).

This organism was found to produce both rough and smooth colonies, the change from mucoid to nonmucoid being associated with a change of rough to smooth. Rough colonies are always mucoid, while nonmucoid colonies are always smooth. The two forms are closely related serologically, the rough form producing a larger amount of specific substance than the smooth form. Both forms are isolated directly from the tissues of diseased foals, either alone or associated.

Serologic characteristics of Shigella equirulis (B[acterium] nephritidis equi), P. R. Edwards (*Jour. Infect. Diseases, 51 (1932), No. 2, pp. 268–272*).—In this continuation of the studies above noted, the serologic characteristics of 40 cultures of *S. equirulis* studied by agglutination, precipitation, complement-fixation, and agglutinin-absorption tests are reported upon. The strains investigated formed a heterogeneous serologic group. With antiserums prepared from seven strains, only three cases of serologic identity were noted.

[Poultry disease studies in Oklahoma], O. E. Goff and R. B. Thompson (*Oklahoma Sta. [Bien.] Rpt. 1931–32, pp. 136, 137, 141–143*).—The importance of control work with pullorum disease and the various commercial methods of testing to detect its presence are discussed. Results with vaccination as a means of control of fowl pox are reported.

Natural resistance to disease in the chicken, I–III, W. V. Lambert (*Jour. Immunol., 23 (1932), No. 3, pp. 229–240, fig. 1; 241–251; 253–260, figs. 2*).—This contribution is presented in three parts.

I. *The effect of selective breeding on natural resistance to fowl typhoid.*—This is a report on the results obtained in five generations of selection for resistance to a standard infection with the fowl typhoid bacterium in the chicken. "A marked increase in the resistance of the selected population has resulted, the observed mortalities in the selected stocks, from the first to fifth generations, being 39.8, 29.3, 15.4, 15, and 9.4 per cent. In the unselected (control) populations tested concurrently the respective mortalities were 89.6, 93.2, 86.2, 86.4, and 85 per cent. A combined total of 3,355 chicks, 1,999 in the selected and 1,356 in the control stock, was used in these studies. Reciprocal crosses of selected (resistant) with unselected birds demonstrated that the male, as well as the female, transmits resistance to the offspring, and that a passive transfer of immunity was not a great, if existent, factor in the enhanced resistance of the selected progeny."

II. *Bacteriological studies upon surviving birds of the resistant stock in relation to progeny resistance.*—"Extensive bacteriological examination of the organs of 61 breeding birds, all survivors of a fowl typhoid infection, showed 21.3 per cent of them to be carriers of *S[almonella] gallinarum*. The ovary was the most frequent seat of localization of the bacterium in the females. Only 1 of 7 males examined proved to be a carrier. Chicks hatching from the carrier hens proved slightly, but not significantly, less resistant than those from noncarrier hens. The mortality among 129 chicks from carrier hens was 44.2 per cent and among 366 chicks from noncarrier hens 40.2 per cent. The noncarrier hens were those from which the organism was not isolated. Data secured from bacteriologic examination of a small number of chicks killed at various intervals after infection suggest that chicks from the selected population are more refractory to the fowl typhoid organism than are chicks from an unselected population. Agglutination tests on the blood serum of these chicks indicate that the young chick lacks the ability to develop agglutinins of high titer, if at all."

III. *The comparative resistance of different breeds.*—A total of 1,568 chicks from five breeds and strains of the fowl, and of one group consisting of hybrids between two of the breeds, were injected in the same way with a standard dosage of virulent fowl typhoid bacteria. The percentage of mortalities resulting for the various breeds ranged from 79.7 in the White Plymouth Rock to 94.4 in the Rhode Island Red and for the hybrids between the White Leghorn and Rhode Island Red 86.4.

A list of references accompanies each of the three parts.

Incubator and hatchery sanitation and inspection, C. A. Brandly (*Vet. Med., 27 (1932), No. 10, pp. 442–445*).—This is a contribution from the Kansas Experiment Station.

Coccidiosis of chickens, J. R. Beach (*North Amer. Vet., 13 (1932), No. 10, pp. 27–32, 53, figs. 4*).—This is a practical contribution.

Carriers of infectious bronchitis, A. Komarov and F. R. Beaudette (*Poultry Sci., 11 (1932), No. 6, pp. 335–338*).—An attempt was made at the New Jersey Experiment Stations to determine the distribution of the virus of infectious laryngotracheitis in the body of birds affected with or dead of the disease.

"The liver, spleen, kidney, ovary, and peripheral blood were taken during the incubation period, at the height of the disease, and from dead birds, but in no case was the virus found. The virus could always be demonstrated in the trachea of affected birds. The examination of recent and old recovered birds revealed the fact that certain ones continue to carry the virus in the upper respiratory tract. It is thus conceivable that some of the recovered birds may serve as reservoirs of infection and cause a fresh outbreak in the oncoming susceptible population. Transmission experiments by contact with such birds are being carried on."

The etiology of fowl paralysis (a review of literature), J. Biely and V. E. Palmer (*Vet. Rec., 12 (1932), No. 44, pp. 1302–1309*).—In this contribution the authors briefly review the available literature on the subject of fowl paralysis, with particular reference to the rôle played by intestinal parasites, a virus, or other agencies in the causation of the disease, and in connection with a list of 74 references to the literature.

Observations on the gonads of male birds affected with fowl paralysis (neurolymphomatosis gallinarum), J. Biely and V. E. Palmer (*Canad. Jour. Res., 7 (1932), No. 3, pp. 293–299, pls. 2, figs. 2*).—Observations are presented on six male birds affected with fowl paralysis. Characteristic lymphoid infiltrations were found in the nervous system and in the testes. Lymphomatous tumors of the testes occurred in three of the birds. Evidence is presented that spermatogenesis was definitely suppressed.

So-called range paralysis of the chicken, F. D. Patterson, H. L. Wilcke, C. Murray, and E. W. Henderson (*Jour. Amer. Vet. Med. Assoc., 81 (1932), No. 6, pp. 747–767, figs. 5*).—This contribution from the Iowa Experiment Station reports upon studies initiated in February, 1930.

The disease was found to be transmitted "by the injection of suspensions made from the lesions found in birds affected with this disease. It was transmitted also by pen contact. Evidence has been obtained to indicate that it may be transmitted through the egg. The injection of a suspension made from one type apparently produces practically all the types that are considered as expressions of this disease. A different suspension was used in each of three groups of chickens. Practically the same results were obtained in each group. There is some evidence to indicate that the transmissible agent of this disease may be a filtrable virus. No definite etiologic agent has been isolated as the cause of this disease. Coccidia and other intestinal parasites apparently do not cause this disease, although they may possibly open up avenues for the

entrance of the causative agent and may act as incidental carriers of it. It is not a deficiency disease.

"In general, the incubation period seems to be long; according to our studies it was usually about two months or longer. The clinical course is very variable, usually extending over a period of weeks or months, in some cases for a year or more, while in others it is comparatively short. Rarely, if ever, does a complete recovery occur in positively diagnosed cases. Occasionally temporary improvement or arrested progress of the disease may be noted. The disease seems to spread slowly in affected flocks. As a rule only a few birds become affected at a time, but new cases usually continue to occur for a considerable length of time. The losses over a period of six months or a year, after the first evidence of the disease is noted, are often high."

Pullorum disease infection of the leg joints in baby chicks, A. J. Durant and H. C. McDougle (*Vet. Med., 27 (1932), No. 8, p. 357, figs. 2*).—This contribution from the Missouri Experiment Station reports the isolation of *Salmonella pullorum* in pure culture from the swollen tibiometatarsal joint of chicks which commenced to die when a week old. In one of two flocks examined the swollen joint was accompanied by a twisted and deformed leg.

A rare mode of transmission of pullorum disease, H. P. Hamilton (*Vet. Jour., 88 (1932), No. 9, pp. 375, 376*).—Evidence is presented that the male bird may transmit pullorum infection that will pass through the egg without causing the serum of the hen to react positively to the agglutination test.

Comparison of repeated rapid whole-blood, rapid serum, and tube agglutination tests for the diagnosis of S. pullorum disease, J. Biely and W. Roach (*Jour. Compar. Path. and Ther., 45 (1932), No. 3, pp. 224–229*).—This report of studies conducted in continuation of those by the authors previously noted (E. S. R., 67, p. 603) presents the results secured from repeated testing, for a period of 3 months at 30-day intervals, of a smaller group of birds by the rapid whole-blood (stained antigen), the rapid serum, and the tube agglutination tests.

Four tests for pullorum disease were made at monthly intervals on 110 yearling fowls by the three methods. "The percentage of agreement in diagnosis between the different agglutination tests was as follows: 91.3 per cent by all three agglutination tests, 93.8 per cent by the whole-blood and rapid serum agglutination tests, 94.7 per cent by the rapid serum and tube agglutination tests, and 93.6 per cent by the whole-blood and tube agglutination tests. The percentage of agreement of the four repeated tests by the same agglutination test was as follows: Whole-blood agglutination test 94.5 per cent, rapid serum agglutination test 97.5 per cent, and tube agglutination test 97.7 per cent."

Contribution to a study of avian spirillosis in the Levant (second note) [trans. title], L. Chaillot and L. Saunie (*Bul. Acad. Vét. France, 5 (1932), No. 3, pp. 112–114*).—Avian spirillosis, reported from the Levant for the first time in 1930 by the senior author,[5] is said to be particularly prevalent in the coastal region, where it caused much loss.

What is the common "large roundworm" of chickens? H. A. Baylis (*Ann. and Mag. Nat. Hist., 10. ser., 10 (1932), No. 59, pp. 520–524*).—The author finds that *Ascaridia perspicillum* and *A. lineata* represent a single species of world-wide occurrence, for which the name *A. galli* is available and should be used.

Efficiency of vermifuges for poultry, W. L. Bleecker and R. M. Smith (*Arkansas Sta. Bul. 280 (1932), pp. 40, 41*).—Results obtained with Blackleaf 40, iodine vermicide, and Pulvules No. 142 are briefly noted.

[5] Bul. Acad. Vét. France, 3 (1930), pp. 378, 379.

Problems and observations concerning the transmission of blackhead infection in turkeys, E. E. Tyzzer (*Amer. Phil. Soc. Proc., 71 (1932), No. 6, pp. 407–410*).—In this discussion the author calls attention to the fact that the discovery by Smith and Graybill (E. S. R., 43, p. 586), that blackhead may be produced by feeding large numbers of the embryonated eggs of the cecal roundworm of poultry, *Heterakis gallinae*, has resulted in the demonstration that the infection is actually introduced by the worm egg. Thus, while the blackhead protozoan as it occurs free in the cecal discharges survives for only a brief period, in the egg of the cecal worm it survives for long periods and passes unscathed through the successive freezing and thawing of northern winters. The experimental evidence of the occurrence of the blackhead protozoan in the worm egg appears to be conclusive, although its presence there has not been demonstrated microscopically. It has been found to infect the intestinal tract of a certain proportion of the growing worms, but the route by which it travels to the reproductive system has not been discovered. It is pointed out that not all cecal worms carry the infection, and that a blackhead-free strain of this parasite is at present being propagated in the laboratory.

In a study of the chicken as a source of the disease manifested in turkeys, it was found that in this bird the infection, although varying in severity, is usually mild and followed by a prompt recovery. The organisms thereafter continue to multiply in the cecal contents for indefinite periods and are passed daily in great numbers. It is now quite obvious that a healthy chicken carrier is a much more reliable and fertile source of infection than a sick turkey in which the ceca are often no longer functioning. The wide dissemination of worm eggs over the soil makes it clear how the infection is acquired by young turkeys reared entirely apart from older stock. It is believed that the chicken is the natural host of the blackhead parasite. The survival qualities of the blackhead organism as it occurs within the worm egg are quite remarkable, Heterakis eggs that have been incubated for four weeks at 38° C. having produced infection.

It is pointed out that the parasite is transmitted to avian hosts, the infection being especially fatal to the ruffed grouse in captivity, though on account of its feeding habits occurring rarely, if ever, in the wild state. Quail reared in captivity also frequently show this disease but appear to be somewhat more resistant than the grouse. The disease is especially serious to susceptible game birds that have the habit of feeding on ground ranged over by poultry. Thus numbers of fatal cases of blackhead are encountered in prairie chickens, and this disease has doubtless been concerned in the all but complete extermination of the heath hen on Marthas Vineyard Island. Carriers have not been found among the ring-necked pheasant, nor has it been possible to produce pheasant carriers artificially.

Chronic pullorum infection in the full-grown turkey [trans. title], J. Jansen (*Tijdschr. Diergeneesk., 59 (1932), No. 17, pp. 1047–1049; Ger., Eng., Fr. abs., p. 1049*).—An account is given of pullorum disease as observed in an adult turkey. A post-mortem examination resulted in the finding of a chronic oophoritis, salpingitis, chronic peritonitis, and small spots on the myocardium.

An epizootic in wild geese due to nematode and fungous infections, R. O. Christenson (*North Amer. Vet., 13 (1932), No. 11, pp. 57–59, fig. 1*).—An epizootic of wild geese reared in captivity which killed 44 out of 60 young birds was found to be due to three diseases which can be diagnosed only by post-mortem examination. *Cyathostoma bronchialis* occurred in the Canada goose (*Branta canadensis canadensis*), the bean goose (*Anser fabalis*), and the blue goose (*Chen caerulescens*), all reared in captivity. The gizzard worm,

Amidostomum anseris, occurred in the bean goose. *Aspergillus fumigatus* was found in the Canada goose and the blue goose.

Dracunculus medinensis (Linnaeus, 1758) appears in the United States as a parasite of the fox, E. A. Benbrook (*Jour. Amer. Vet. Med. Assoc., 81 (1932), No. 6, pp. 821–824, figs. 2*).—The author reports the finding of *D. medinensis* in the subcutis of a fox in Iowa. This parasite, known as the guinea worm or Medina worm, has been for centuries a serious problem in man and livestock in parts of the Old World.

Distemper in minks, R. N. Shaw (*Vet. Med., 27 (1932), No. 12, pp. 511–515*).—Adult minks are said to show considerable resistance to distemper, to which cats, dogs, and ferrets are susceptible, although the young are very nearly if not quite 100 per cent susceptible. Homologous anticanine distemper serum was found very effective as a preventive and control measure, although the immunity lasts not longer than three weeks.

An experimental infection of the rabbit with Capillaria hepatica (Bancroft, 1893, D. O. Morgan (*Jour. Helminthol., 10 (1932), No. 2–3, pp. 65, 66*).—The author reports that a culture of embryonated eggs obtained from the liver of a rat infected with *C. hepatica* caused the death of two 5-weeks-old rabbits on the twenty-ninth and thirty-first days, respectively, after a large number of the eggs had been fed to them.

AGRICULTURAL ENGINEERING

[Agricultural engineering investigations at the Arkansas Station], D. G. Carter, J. B. Woods, and R. M. Smith (*Arkansas Sta. Bul. 280 (1932), pp. 34–36*).—The progress results of studies on cotton machinery, effect of deep tillage on soil moisture, control of stem rot of rice by burning, preservation of wooden posts, water cooling of milk, and influence of poultry housing insulation on egg production are briefly reported.

[Agricultural engineering investigations at the Colorado Station], R. L. Parshall, E. B. House, and F. E. Goetz (*Colorado Sta. Rpt. 1932, pp. 54–57, 60–62*).—The progress results of irrigation investigations, including pumping and evaporation, and of investigations on oil-graveled roads, hair cracks in concrete, and sugar beet machinery are briefly reported. The sugar beet machinery investigations and most of the irrigation investigations are being conducted in cooperation with the U. S. D. A. Bureau of Agricultural Engineering.

[Agricultural engineering investigations at the Illinois Station] (*Illinois Sta. Rpt. 1932, pp. 175–188, figs. 2*).—The progress results of investigations on rural use of electricity, by E. W. Lehmann and A. L. Young; size of septic tanks, by Lehmann and A. M. Buswell; tractor lubricating oils and repairs, by R. I. Shawl; plowing for corn borer control, by Young and Shawl; terracing, by Lehmann and E. G. Johnson; improved harvesting methods, by Lehmann and Young; crop drying, by Lehmann, R. H. Reed, W. L. Burlison, and G. H. Dungan; and stationary spray plants, by Lehmann, Reed, H. W. Anderson, and R. L. McMunn, are briefly reported.

[Agricultural engineering investigations at the Oklahoma Station] (*Oklahoma Sta. [Bien.] Rpt. 1931–32, pp. 7–13, 140, 141, 275–277, figs. 3*).—The progress results of investigations on soil erosion, by N. E. Winters; the use of insulating board for stabilizing temperatures in poultry houses, by O. E. Goff and C. Roberts; and the use of terraces for the control of soil erosion, by L. E. Hazen, are briefly noted.

Surface water supply of the United States, 1931, Part 11 (*U. S. Geol. Survey, Water-Supply Paper 721 (1932), pp. XI+497, fig. 1*).—This report, pre-

pared in cooperation with the States of California and Oregon, presents measurements of flow made on streams in the Pacific slope basins in California during the year ended September 30, 1931.

Index of analyses of natural waters in the United States, 1926 to 1931, W. D. COLLINS and C. S. HOWARD (*U. S. Geol. Survey, Water-Supply Paper 659–C (1932), pp. II+191–209+V*).—This report is intended to serve as a guide to the larger collections of analyses of the mineral content of natural waters in the United States published from 1926 to 1931, and continues earlier work (E. S. R., 54, p. 779).

The travel of pollution underground, A. F. DAPPERT (*Amer. Jour. Pub. Health, 22 (1932), No. 9, pp. 989–994*).—This is a condensed version of a paper presented at a meeting of the New York State Sewage Works Association at Buffalo, N. Y., in June, 1932. It summarizes different studies on the distance of travel of bacterial and chemical pollution from sewage through soils, bringing out that chemical pollution can be carried for a long distance through fine sand even when the rate of ground water flow is fairly slow.

Bacterial contamination has been found to travel as far as 232 ft. through fine sand, but apparently is removed in a relatively short distance. However, chemical pollution as indicated by free ammonia tests has been found to travel through fine sand for distances considerably in excess of 1,400 ft.

Public Roads, [December, 1932] (*U. S. Dept. Agr., Public Roads, 13 (1932), No. 10, pp. 153–168+[2], fig. 1*).—This number of this periodical contains the current status of Federal-aid road construction as of November 30, 1932, an article on The Problem of Motor Vehicle Regulation, by H. H. Kelly (pp. 153–166), and appendixes on State legislation on certain aspects of motor vehicle regulation and maximum limitations imposed by States on size and weight of motor vehicles on highways outside of incorporated areas, 1932 (pp. 166–168).

The practical problems of corrosion.—Part VII, Some tests of protective painting: Interim report, S. C. BRITTON and U. R. EVANS (*Jour. Soc. Chem. Indus., Trans., 51 (1932), No. 28, pp. 211T–218T*).—The progress results of studies on paint as a protective coating are briefly reported. Wrought iron and copper steel, properly painted, appear to give better service than ordinary steel, owing to the more adherent character of the rust. Electrolytic iron develops rust more slowly than steel at first, but after 2½ years there is little to choose. A single coat of red lead in the Cambridge, England, atmosphere gives almost complete protection to good steel for a period long enough to produce perforation of the specimen (0.32-mm thick) where it is unpainted.

Salt, moisture, or old rust shut in below a paint coat cause it to fall prematurely. Mill scale varies greatly in its behavior. A typical scale may seem to help an unsatisfactory paint to protect from frontal attack, but below a good paint (which by itself should prevent frontal attack) scale aids the undermining type of attack and is particularly unfavorable on its effect when the time for repainting arrives. A scale broken locally is far more objectionable than a complete scale, and in such cases rapid peeling of paint and scale together often occurs.

Metallic zinc paints can give some protection even at an uncoated gap in the coat under atmospheric exposure, while red lead gives some protection at a scratch line under immersed conditions. The amount of oil and thinner does not greatly affect the value of red lead paints, provided that the paint is not so thin as to produce clear channels. Iron oxide paints become steadily less protective as they become thinner. The effective life of the paint decreases with the drier content if it is applied in dry weather, but increases with the drier content if painting is done in wet weather.

The compositions of the metals and paints used are shown in appendixes.

Gasoline automobiles, J. A. Moyer (*New York and London: McGraw-Hill Book Co., 1932, 4. ed., pp. IX+509, figs.* [467]).—This book contains chapters on automobile types and parts; automobile engines; gasoline and substitutes; gasoline carburetors; automobile ignition; magnetos and ignition testing; electric starters; clutches, transmissions, and differentials; lubrication and cooling systems; and automobile troubles and noises.

The cracking of palm oil, J. C. Morrell, G. Egloff, and W. F. Faragher (*Jour. Soc. Chem. Indus., Trans., 51 (1932), No. 18, pp. 133T, 134T*).—Studies are reported on the possibilities of palm oil as a source of motor fuel. Two grades of palm oil, Niger and Sumatra, were used as cracking stock. The Niger palm oil was reddish-brown and contained approximately 50 per cent of free fatty acids. The Sumatra oil was light orange in color, showing about 6 per cent of free fatty acids.

A yield of 62 per cent of motor fuel was produced from Sumatra palm oil by cracking. At the same time 11.6 per cent of Diesel oil was produced. A yield of 71 per cent of motor fuel was formed from Niger palm oil by cracking, together with 9.5 per cent of Diesel oil. It was found that the cracked distillates from palm oils can be refined to give motor fuel suitable for the operation of internal-combustion engines.

Palm oils consisting principally of glycerides of the fatty acids break down under pressure distillation into low-boiling hydrocarbons with the formation of water, aldehydes, fatty acids and glycerides of lower molecular weight, gas, and coke. The free fatty acids present in palm oil are decomposed similarly. The hydrocarbons resulting from the pyrolysis of palm oil belong to the four major groups, namely, olefin, aromatic, naphthene, and paraffin hydrocarbons.

The Hager knife sled, H. H. Finnell ([*Oklahoma*] *Panhandle Sta., Panhandle Bul. 43 (1932), pp. 6, fig. 1*).—Modifications of the common knife sled used in the cultivation of listed row crops are briefly described and illustrated.

Instead of a straight-edged blade the cutting edge is serrated. Otherwise the blade is of the same form as those ordinarily used. The serrations are obtained by drawing out the edge at intervals of about 4 in. on an ordinary straight-edged blade when it is being sharpened. The effects of a serrated edge are mainly to increase the cutting efficiency of the blade. It is enabled to cut weeds so large as to resist a smooth knife and to cut its way through accumulations of trash which might otherwise foul the blade. The serrations also serve to maintain the cutting efficiency of the blade after the edge is much worn.

The second modification consists of a pair of short secondary knives carried on the heel of the sled which are curved up at the end in such a manner as to draw into the furrow a sufficient amount of loose soil to cover small weeds in the drill row, thus enabling the sled to do a complete job of cultivation at one operation. The secondary blades also act to stabilize the implement, reducing side play and increasing considerably the ease of operation.

Mechanical corn pickers in Indiana, L. G. Hobson and R. H. Wileman (*Indiana Sta. Bul. 362 (1932), pp. 23, figs. 5*).—Records of costs and performance on 187 mechanical corn pickers operated in nine counties of Indiana, secured in cooperation with the U. S. D. A. Bureau of Agricultural Economics, are summarized. The pickers were of the 1-row type, with and without a tank, and the 2-row type.

Machine husking, particularly with 2-row pickers, was more economical on most of the farms in this study during the 1929 and 1930 seasons than was hand husking. During the 1931 season hand husking costs were so low that

machine husking in most cases was not economical. Stalk pasture was of less value after a mechanical picker than after hand huskers. Two-row pickers left about one-third more corn in the field than did 1-row pickers. Hand huskers left about one-third as much corn in the field as did mechanical pickers. Eighty-four per cent of the acreage picked by mechanical pickers was later pastured by livestock, and an additional 11 per cent was gone over and picked up by hand.

Mechanical picker owners gave considerable weight to such advantages as getting the corn out of the field early in better weather and in better condition, avoiding the inconvenience of having extra men to board and lodge during corn husking, and the fact that it was easier work to husk with a picker. Disadvantages frequently mentioned were trouble in using pickers in mud or soft ground, and when the ground and stalks were frozen, and difficulty in doing a good husking job when the corn was down very badly.

Celery-washing by machinery (*Jour. Min. Agr.* [*Gt. Brit.*], *39 (1932), No. 4, pp. 351, 352, pls. 4*).—A machine developed in England for washing celery is briefly described and illustrated. It consists essentially of a heavy spoked and rimmed wheel, 8 ft. in diameter, set on a vertical spindle so that it can revolve horizontally at a height of about 3 ft. from the ground. Around the outside of the rim is fixed a series of spikes and hooks in pairs, so placed that each pair will hold a stick of celery horizontally, these spikes and hooks being made of rustless steel to avoid any possibility of staining the celery. The heads of celery are attached to and removed from the wheel while it is being rotated at the speed required for washing, and the rotating of the wheel is carried out by the man who places in position the trimmed heads of celery, which are then carried through a tunnel of sheet iron. Inside this tunnel is fixed a series of sprays in the form of horseshoes. The water pumped into the system is sprayed under pressure into the sides and hearts of each head of celery at different angles, the jets being so arranged that the force of water assists the rotation of the wheel. The daily output of washed celery from such a machine represents not less than the produce of about half an acre.

The drying of wheat, E. Stansfield and W. H. Cook (*Canada Natl. Res. Council Rpt. 25 (1932), pp. 104, pls. 4, figs. 33*).—This reports a continuation and extension of previous studies (E. S. R., 62, p. 429).

In 1929 a new experimental drier was constructed in order to increase the range of operation and the scope of the experiments. The results obtained with this drier form the main body of this report. Nine main series of experiments were made, the most extensive being a study of the continuous discharge and batch methods of drying. Some observations were made on commercial driers at Vancouver in 1930, and these are reported in Appendix A. A review of the literature on bin drying is given in Appendix B. Other experiments, conducted to aid in interpreting the results, are included in the report and in the additional appendixes.

The temperature of the hot air used for drying is of prime importance in commercial driers, and it has been found that the measurement of this temperature may be seriously affected by radiation. The extent of the resulting error depends on the location and type of the measuring instrument. A suitable location for measuring the average temperature of the grain is near the bottom of the heater section at a point where the air flow is at a minimum.

The rate of drying increases with the heat content of the air supplied per unit time. Raising either the hot-air temperature or the hot-air flow will, therefore, dry the grain more rapidly. Fast drying is deprecated, however, since it causes injury to baking quality.

Drying to a low final moisture content tends to give high wheat temperatures, since the cooling effect of evaporation is reduced as the grain becomes drier. Rapid drying also gives high wheat temperatures. There is apparently little relation between the initial moisture content and the temperature attained by the wheat. These results show that overdrying and rapid drying are the main causes of high grain temperatures in the heater section.

The milling results show that there is no significant difference in the yield of flour under the tested conditions of drying, hence the milling quality was unaffected by drying. The baking quality, on the other hand, showed injury under certain conditions, notably the temperature of the hot air. Above 180° F., the maximum safe temperature for the drying air, the extent of injury increases with the temperature and rate of drying. Even at 180° damage may occur if high air flows are used. Injury from rapid drying is unlikely if the wheat remains in the heater section not less than 10 minutes for each 1 per cent loss in weight when the wheat is dried over a moisture range of from 19 to 14 per cent. The limiting rate varies with the drying range. High wheat temperatures, though to a less extent than hot-air temperatures, are related to injury, and there is probability of damage by continuous drying if the temperature of the wheat leaving the heater section exceeds 110°. Grain of high or low moisture content can be dried with equal safety provided an air temperature of 180° is not exceeded and the rate of drying is not excessive. The results also indicate that if an air temperature of 180° is not exceeded little damage will be caused by such slight overdrying as is beyond the control of the operator.

It was found that drying in cold weather is no more detrimental to baking quality than drying under ordinary conditions. Drying with humid air reduced the drying efficiency and gave slightly higher wheat temperatures, but did not affect the baking quality significantly.

Batch drying was found to be less efficient and consequently slower than the continuous method, and the maximum wheat temperature observed in the heater section was higher than in runs by the continuous method. In batch drying, unlike continuous drying, the temperature of the wheat is much more dependent on the air temperature than on the rate of drying. The risk of local overheating can therefore be reduced by the use of low air temperatures. The results of the baking tests show that the limiting permissible conditions, with respect to air temperature and rate of drying, for continuous runs are also permissible for batch drying.

Tests of local overheating due to metal walls in commercial driers showed less local overheating, a greater drying efficiency, and somewhat less injury to baking quality with the metal than with the cardboard partitions. This shows that good heat conductors tend to distribute the heat more uniformly than insulating materials. Contact with hot metallic surfaces therefore appears not to be a factor in causing injury in commercial drying.

Forage grinding and chopping with electric motors (*Chicago: Com. Relat. Elect. Agr.*, [*1932*], *pp. 4, figs. 3*).—General information is given on the subject based on the results of tests at different experiment stations.

Feed grinding with electric motors 2 hp. and smaller (*Chicago: Com. Relat. Elect. Agr.*, [*1932*], *pp. 4, figs. 5*).—Data are presented on the adaptation of small electric motors of 2 h. p. or less to feed grinding.

Feed grinding with electric motors 3 hp. to 7½ hp. (*Chicago: Com. Relat. Elect. Agr.*, [*1932*], *pp. 4, figs. 4*).—Data are presented showing how electric motors from 3 to 7.5 h. p. may be adapted to feed grinding.

Feed grinding with electric motors 10 hp. and larger (*Chicago: Com. Relat. Elect. Agr.*, [*1932*], *pp. 4, figs. 4*).—Data on the adaptation of electric motors of 10 h. p. and larger sizes to feed grinding are presented.

Milking-machines (*Jour. Min. Agr.* [*Gt. Brit*], *39* (*1932*), *No. 4, pp. 317–322*).—The results of an inquiry to ascertain the present position of mechanical milking among the members of the milk-recording societies of England and Wales are briefly summarized.

These indicate that machine milking was being carried out in 373 milk-recorded herds in England and Wales, and that with the exception of about 15 machines all had been installed since 1924 and more than one-half during 1929–1931. This number, however, represents only about 7.5 per cent of the total milk-recorded herds. The average size of the herds was 36 cows, compared with a general average of about 23 cows for all recorded herds. This indicates that machines had been installed to a greater extent in the larger herds. Almost all the machines in use were of the single-unit type and were in general use throughout the year. They were driven either by standard petrol or paraffin engines or by independent motors. About 22 per cent of the machines were driven by electricity as compared with less than 6 per cent in 1918. Heavy-oil Diesel engines were used in a few instances.

On account of the limitations of available transportation facilities and the requirements of retail dairies, the average time of milking is relatively short, i. e., 1 to 1.5 hours, and in some cases even less than 1 hour. It is here that the value of a machine becomes obvious, quite apart from the actual saving in labor.

In the case of smaller herds no appreciable saving is reported, but in herds above 60 cows there is a clear saving of about 40 per cent in man power during milking. Producers with herds of between 25 and 50 cows estimate a saving in labor equivalent to 1.5 to 2 men, although the range is extremely wide, varying from 0 to 60 per cent. It was generally agreed that mechanical milking was preferable to average hand-milking but inferior to a really efficient milker.

Temperature gradient in milk cooled by direct immersion, R. G. Bressler, jr., and J. E. Nicholas (*Agr. Engin., 13* (*1932*), *No. 9, pp. 230, 231, figs. 4*).—Studies conducted at the Pennsylvania Experiment Station on the rate of cooling in a direct immersed 10-gal. can of milk and on the factors which most affect the temperature gradient are reported. Milk was cooled with a comparatively small quantity of cooling water which was not agitated, with a similar small quantity agitated during the cooling process, and with a comparatively large quantity of cooling water which was not agitated during the cooling process.

It was found that milk may be cooled as rapidly by direct immersion as by aeration. By direct immersion all of the milk produced begins to cool at the same time. Direct immersion is recommended in all cases for small dairy farms unless the milk is bottled on the farm. It is possible by direct immersion to cool milk to below 50° F. in 30 minutes if the cooling water is at less than 36°, the ratio of quantity of cooling water to quantity of milk is greater than 8, and the cooling water is agitated.

A temperature gradient is found to exist when milk is cooled by direct immersion. The temperature gradient will be a minimum if low temperature cooling water is used. A temperature of 33 to 36° is recommended. The lower limit is to be used if uniformity and rapidity in milk cooling is desired. A large quantity of cooling water is desirable for rapid cooling of the milk if no agitation is employed. The value for the ratio of cooling water to milk should be 8, 12, and 16 for 33, 36, and 40° cooling water, respectively, without agitation.

Design factors affecting the strength and rigidity of wooden crates, G. E. Heck (*U. S. Dept. Agr. Circ. 236 (1932), pp. 27, figs. 24*).—The purpose of this publication is to show the effect of various design details on the strength and rigidity of wooden crates. In this connection the results are presented of tests made in cooperation with the University of Wisconsin on 550 crates of ponderosa pine, western hemlock, and Sitka spruce.

It was found that the point of failure in diagonally braced crates made of lumber free from injurious defects is usually at the fastening of the diagonals to the edge members. The forces in the various crate faces tending to cause the splitting of the edge members to which diagonal braces are nailed are approximately proportional to the lengths of the edge members to which the braces are not nailed. A long edge member will fail more readily by splitting at the fastening of the diagonal braces than a short edge member when the braces are nailed to the narrow faces of the edge members.

Increase in width or thickness of all the crate members generally results in a substantial increase in strength, provided the nailing is in accordance with the recommended nailing schedule. The best practice is to use rectangular crate members as nearly square as practicable. Crates of the sizes tested, having 6 diagonal braces one-half the thickness of the edge members, are nearly as strong and rigid as similar crates having braces the same thickness as the edge members. The difference in strength between crates having the long edge members of the smallest faces placed outside the short edge members and crates having the short edge members of the smallest faces placed outside the long edge members is so small that the controlling factor should be convenience and protection of the faces of the commodity rather than increased strength of the crate.

Whether diagonal braces are in tension or compression under load makes no difference in the ultimate strength of a crate, provided the braces are thick enough to develop the full strength of the nailed joint without bending. Under normal conditions this would be at a ratio of 60:1. The strength and rigidity of a crate increases with each diagonal brace added, the maximum increase occurring with the addition of the sixth brace. Unless the commodity is known to be able to take torsional stress or is so suspended in the crate that it will not twist with distortion of the crate, all faces of the crate should be braced.

Crates having 12 diagonal braces (2 crossed in each face) one-half the thickness of the edge members showed approximately one and one-half times the strength of crates with 6 diagonal braces of the same thickness as the edge members nailed to the edges of the edge members. In crates with 2 braces one-half the thickness of the edge members crossed in each face, nailing the braces at their intersection resulted in slightly increasing the strength of the crates. In crates having 1 diagonal brace in each face, nailing reinforcing blocks to the edge members at the ends of all 6 diagonals resulted in an average increase in strength of approximately two-thirds, as compared with the strength of unreinforced crates. For crates with 6 diagonal braces, nailing the braces to the wide faces of the edge members and clinching the nails resulted in the crates having more than twice the strength of crates in which the braces were nailed to the edges of the edge members.

Some observations on physical methods for the examination of paint, J. A. F. Wilkinson (*Jour. Oil and Colour Chem. Assoc., 15 (1932), No. 148, pp. 259–275, figs. 2*).—The urgent need for accurate and reliable methods for the physical examination of paints is pointed out, especially in connection with the preparation of specifications for paints containing vehicles other than linseed

oil. Possible methods of preparing films of the required thickness which have been dried under standard conditions, and of measuring various physical properties are discussed, flexibility and hardness being considered to be two of the most important.

AGRICULTURAL ECONOMICS

[Investigations in agricultural economics at the Arkansas Station, 1931–32] (*Arkansas Sta. Bul. 280 (1932), pp. 58–63*).—Results not previously noted are briefly reported as follows:

Comparisons are made by C. O. Brannen of the relation of farm taxes to net returns in 1930 and 1931 and of the rates of tax delinquency for 1927 and 1931. A summary is made by Brannen of the changes in the volume and distribution of car-lot and truck shipments of Arkansas grapes from 1926 to 1930, and by E. P. Dargan of the labor and power costs per acre of cotton and of all crops with different degrees of mechanized power as found in a study in 1929.

[Investigations in agricultural economics and farm management at the Illinois Station] (*Illinois Sta. Rpt. 1932, pp. 97–101, 146–161, 162–171, 172–174, 194, 195, 201, figs. 6*).—Results of investigations not previously noted are reported on as to livestock shipping associations (pp. 97–99) and shrinkage in shipping hogs by truck and by rail (pp. 99, 100), both by R. C. Ashby; increased use for hogs of local livestock markets and concentration points, by Ashby and H. P. Rusk (pp. 100, 101); farm organization and management studies by H. C. M. Case, M. L. Mosher, et al. (pp. 146–149); farm earnings in 1931, by P. E. Johnston, R. R. Hudelson, Case, and L. Wright (pp. 149–160); costs of production of corn, oats, and wheat, by Case, R. H. Wilcox, and E. L. Sauer (pp. 160, 161); costs per crop acre for labor, power, and machinery on farms where tractors have replaced only one or two horses as compared with three or four horses, by Johnston (pp. 162, 163); farm leases, by Hudelson and Case (p. 163); returns in poultry plants and farms, by Wilcox and L. E. Card (pp. 163, 164); value of premiums on corn for color (p. 165); financial operation of elevators, by C. L. Stewart and L. J. Norton (pp. 165, 166); utilization of Chicago grain storage space, by Norton (pp. 166, 167); new outlets for soybeans, by Stewart and W. L. Burlison (pp. 167, 168); trend of farm products prices studies, by Norton (p. 168, 169); farm real estate values, by Stewart (pp. 169–171); butter value cycles, by R. W. Bartlett and C. A. Brown (pp. 172–174); changes in the short- and intermediate-term credit situation, by Norton (p. 174); and on the marketing of Calhoun County apples (pp. 194, 195) and peach marketing (p. 201), both by J. W. Lloyd and H. M. Newell.

[Investigations in agricultural economics at the Oklahoma Station, 1930–1932] (*Oklahoma Sta. [Bien.] Rpt. 1931–32, pp. 188–205, 207–216, figs. 7*).—Results of investigations not previously noted are reported on as to farm taxes and farm tenantry in Oklahoma, by J. T. Sanders; farm income and costs of production, by P. H. Stephens; sales of cotton in the seed, by L. S. Ellis, C. C. McWhorter, and A. M. Dickson; cooperative elevators and creameries, by R. A. Ballinger; and grade and staple length of Oklahoma cotton, by McWhorter.

[Papers presented at the 1931 conference of the Agricultural Economics Society, Great Britain] (*Jour. Proc. Agr. Econ. Soc., 2 (1932), No 2, pp. 75–118*).—Included are the following papers and discussions thereon presented at the conference held at London, December 8 and 9, 1931: The Government and Agricultural Marketing, by F. J. Prewett (pp. 78–87); The Political Economy of Agriculture, by J. Duncan (pp. 88–91); Some Aspects of Demand and Con-

sumption in Relation to Marketing Studies, by R. B. Forrester (pp. 92–101); and The Position of the Sheep Enterprise, by A. G. Ruston and V. Liversage (pp. 102–118).

Profits from winter feeding in northern Colorado, R. T. Burdick and H. B. Pingrey (*Colorado Sta. Bul. 394 (1932), pp. 75, figs. 19*).—This study was made in cooperation with the Bureau of Agricultural Economics, U. S. D. A.

For the years 1923–1929 feeding cattle and sheep combined brought into Colorado approximately $2,500,000 per annum, and for the period 1930–1931 lost about $5,500,000 per annum. Men who fed both cattle and sheep made more money and had less losses than men who fed either one only. The total cost per hundredweight of gain for the 8 years 1922–1929 was $16.28 for lambs and $14.84 for 2-year-old steers. The market gain per day was 0.2 lb. for lambs and 1.7 lbs. for steers. In the 1930–31 feeding season northern and western lambs made slightly better daily gains than southern lambs. Lambs sold in March and April reach a market about 25 to 30 cts. higher per hundredweight than the January and February market.

The results of this study are presented so that, with prevailing feed prices, one may estimate the cost of feeding and the necessary selling price. Factors affecting prices and profits are listed.

The fact that the farmers who fed made more money than could be accounted for directly from lamb or cattle feeding was taken as indicative that the feeders studied were superior farmers and that there are indirect benefits derived from feeding.

A study of costs and methods of producing cattle and sheep on the range in Colorado, L. A. Moorhouse (*Colorado Sta. Rpt. 1932, p. 39*).—Results for 1929 and 1930 are briefly summarized.

California grape acreage, production, yields, and acreage per farm, 1930, S. W. Shear (*California Sta., 1932, pp. [3]+52+[1]*).—This is a mimeographed statistical summary based chiefly on a farm-to-farm grape census enumeration made by the California Grape Control Board in 1931. The tabulations are made by varieties of grapes and counties and districts of the State.

Cost of producing farm crops in the Prairie Provinces, [Canada], E. S. Hopkins, J. M. Armstrong, and H. D. Mitchell (*Canada Dept. Agr. Bul. 159, n. ser. (1932), pp. 78, figs. 17*).—Tables are included and discussed showing the average costs, 1923–1930, by items of producing different crops at each of the eight Dominion Experimental Farms in the Prairie Provinces, and of producing wheat on the Dominion Illustration Stations, 1922–1930, and on selected private farms in the Provinces. Farm budgets are given for farms of different sizes from 160 to 1,920 acres, showing the estimated cost of equipment, by items, value of land and buildings, the annual operating cost, yields, and costs per acre and per bushel. The costs of operating farm machinery are discussed.

Using replies to questionnaires sent to representative farmers, the advantages of the tractor, trend in tractor sizes, effects of tractor use on number of horses, size of farm justifying use of tractor, cost of tractor operation, comparative costs with horses and tractors, width of tractor implements required, the costs of harvesting wheat with binder and separator and with combined harvester-thresher, and the normal day's work with different types of equipment and for different operations are also discussed.

Some miscellaneous data are included on the number and size of farms in the Prairie Provinces, yields of wheat in the Provinces and in exporting and importing countries, and the cost of shipping wheat from western Canada to Liverpool.

The dairying industry of Australia: Report of Federal Dairy Investigation Committee.—I, Farm production (*Canberra: Govt., [1931], pp. 204, pls. 10*).—This first report of the committee deals with the means of economically increasing dairy production in the several States and districts of Australia. The present extent and value of the industry, the existing conditions and practices, and the possibilities of improvement are discussed. Suggestions are made as to research, extension, and educational work to be done.

The wheat problem in U. S. S. R., V. P. Timoshenko (*Jour. Farm Econ., 14 (1932), No. 2, pp. 284–294*).—This is a discussion of the wheat and other crop production problems in Russia.

The Wheat Act, 1932 [Great Britain] (*Jour. Min. Agr. [Gt. Brit.], 39 (1932), No. 6, pp. 509–513*).—The object and scheme of operation under the act are briefly described.

Forecasting the yield of winter wheat seven months prior to harvest, H. J. Henney (*Jour. Farm Econ., 14 (1932), No. 2, pp. 319–330, figs. 5*).—This contribution from the Kansas Experiment Station takes up the relation of rainfall to the production of winter wheat from 1916 to 1929, inclusive, in 14 of the largest wheat-producing counties of Kansas, the factors used being Y, production in percentages of normal trend, X_1, inches of fall precipitation (August to October, inclusive), and X_2, index of spring precipitation (March to June, inclusive) one year previous to harvest. The steps in the analysis are shown and discussed.

The index of correlation between the actual production and the final estimate of production, using the combined effect of X_1 and X_2, was 0.9275 ± 0.0252. The modal error in estimating was less than 7 per cent. The errors for the several years varied from 1 to 25 per cent, those for 11 of the 14 years being less than 8 per cent.

The concept of marginal land, G. M. Peterson and J. K. Galbraith (*Jour. Farm Econ., 14 (1932), No. 2, pp. 295–310*).—Theoretical margins, remuneration at margin of cultivation, the factors determining the position of the margin of cultivation as to grade of land, the relation of the margin of cultivation to the "opportunity" margin for nonagricultural use, the shifting character of the margin of cultivation, and the capacity of the operators in association with the land and the standard of living which they will accept, the predetermined size of the farm unit, the price obtaining for the crops which the specific grade of land under consideration permits of production proximate to the margin, and the prime pecuniary costs of cultivation as important factors determining the grade of land which will mark the position of the margin of cultivation are discussed. The conditions under which, from the standpoint of a single production unit, production may be carried on on submarginal land are outlined.

Land utilization in Lawrence County, Ohio, J. H. Sitterley, H. R. Moore, and J. I. Falconer (*Ohio Sta. Bul. 514 (1932), pp. 48, figs. 14*).—This is a study similar to that previously noted (E. S. R., 66, p. 284). The data are analyzed and discussed under the same general headings and with the same purpose to show how the less favorable agricultural areas of Ohio are adjusting themselves to the new conditions brought about by economic and social changes of the past and present century.

Taxation of land values in Canada, M. Newcomer and R. G. Hutchinson (*Jour. Polit. Econ., 40 (1932), No. 3, pp. 366–378*).—A description and discussion of the development and present status of the systems of taxation of real estate in the four western Provinces of Canada.

Farm labour research in the United States, J. C. Folsom (*Internatl. Labor Off. [Geneva], Internatl. Labor Rev., 25 (1932), No. 5, pp. 646–665*).—The investigations made by the Congress, the Federal Departments of Agriculture and

Labor and the Bureau of the Census, by State departments of agriculture and labor, commissions, and agricultural experiment stations, by nonofficial institutions, and by individuals, and the studies on the outlying possessions are briefly described. Some of the unsurveyed and insufficiently surveyed problems are outlined. A bibliography contains references to representative studies.

The agricultural labour situation in Hungary (*Internatl. Labor Off. [Geneva], Internatl. Labor Rev., 25 (1932), No. 5, pp. 673–678*).—This is a summarization of the section on labor of the 1930 annual report of the Hungarian Chamber of Agriculture.

Indications of changes in the demand for agricultural products, E. J. Working (*Jour. Farm Econ., 14 (1932), No. 2, pp. 239–256, figs. 10*).—A discussion of how price analyses such as made by the Bureau of Agricultural Economics, U. S. D. A., may be interpreted in terms of shifts of demand and of some general indications of shifts in the demand for agricultural products as a whole.

The shifting demand for selected agricultural commodities, 1875–1929, H. Schultz (*Jour. Farm Econ., 14 (1932), No. 2, pp. 201–227, figs. 8*).—This study was made on funds granted by the social science research committee of the University of Chicago. The commodities studied were corn, wheat, potatoes, barley, rye, buckwheat, hay, oats, and sugar. The data were expressed in terms of bushels per capita and cents per bushel for the first six commodities, in tons per animal unit and dollars per ton for hay, in bushels per animal unit for oats, and in pounds per capita and cents per pound for sugar. The period of the study is broken into 1875–1895, the period of general falling prices; 1896–1914, the period of general rising prices; and 1915–1929 (1917–1921 omitted), the period of the World War and reconstruction. The derivation of the equations for corn is gone into in detail.

Charts are included showing for corn for each period the basic adjusted annual data used in deriving the elasticity of demand and rate of shift in the demand curve; the relation between per capita consumption and the real prices when the data are not being corrected for the effects of "time," with the demand curve resulting when such correction is made; the relation between per capita consumption corrected for the effects of changes in the real price and time; the per capita demand showing the relation between per capita consumption which is independent of time and the part of the real price which is independent of time; and the relations of consumption per capita, real price, and time. A table is included showing for each of the nine commodities for each period the equations of demand, coefficients of multiple correlation, quadratic mean errors, and the percentages of variance accounted for by price and time. The relative rates of shift of the per capita demand curves for each commodity are also plotted.

Some of the conclusions reached follow: The per capita demand curves of farm crops, of which the nine studied are a fair sample, have either ceased to shift upward or have begun to shift downward. The only upward shift that may be expected in the near future will be due to normal increase in population, but the rate of population increase in the United States has been decreasing and the population is rapidly approaching its upper limit. The secular decrease in the rate of shift in per capita demand for the crops studied is probably due to physiological causes, the shift of population from country to city, the increasing use of the automobile, and the growing proportion of old people in the population, favoring a smaller consumption of calories per capita. The decreasing per capita demand for some of the basic crops and the technical changes in American agriculture suggest that the future will need relatively fewer farmers and probably fewer farms, and that agriculture will have to

adjust itself to these conditions or seek outlets for production in foreign countries.

The effect of a business depression on the demand for livestock products and the outlook for these products, W. C. WAITE (*Jour. Farm Econ., 14 (1932), No. 2, pp. 228–238, figs. 4*).—In this article from the Minnesota Experiment Station, a table is given showing the indexes, by years 1910–1930, of the retail demand in the United States for certain food products. Charts are given showing, by months 1921–1931, the percentages which the demand for beef, pork, mutton and lamb, butter, cheese, and condensed and evaporated milk were of the demand in the corresponding month of the preceding year and the 3-year moving average of the ratio of the composite price of 3 lbs. of corn, oats, and barley to the composite price of butter, pork, and beef produced from 3 lbs. of grain.

The method used in arriving at the indexes of change in demand is described as follows: "The usual price analysis is primarily interested in determining the elasticity of demand for the product, and changes in demand ordinarily appear as trends eliminated in the course of the analysis. For example, a correlation is computed in which price, supply, and time are treated as separate variables. The trends of price and supply jointly are then taken to indicate the changes in demand. For our purposes a somewhat more flexible method is needed, so we reverse the process, endeavoring to eliminate the price-supply relationship and leave the remainder as an index of the change in demand." In doing this two assumptions are made, (1) "that the commodity has a certain known elasticity of demand, and that this elasticity is constant at all prices," and (2) "that the elasticity remains unchanged through the various shifts or changes in demand. . . . The indexes . . . have been computed by percentage changes from the base; the percentage increase or decrease in price added to the reciprocal of the elasticity times the percentage increase or decrease in quantity."

The outlook is summarized as follows: No increase in consumer demand can be expected until consumer incomes improve. An increase in demand will probably follow changes in income about proportionally. The elements essential for a rapid recovery are not present in the current situation, so the best prospects are for a gradual recovery. Producer demand may be expected to increase earlier than consumer demand because of reduction of margins. The early part of the depression will probably be the period of lowest producer demand, and some gains have already appeared due to narrowing of margins. But for the increased volume of production, improvement could be looked forward to with some confidence. Marketings in all lines of livestock products may be expected to increase during the next few years, but this will result in unfavorable feeding ratios and difficulties for producers other than the more efficient.

International relations and financial conditions in foreign countries affecting the demand for American agricultural products, L. PASVOLSKY (*Jour. Farm Econ., 14 (1932), No. 2, pp. 257–265*).—The international relations and financial conditions of different countries, especially Great Britain, Germany, and Italy, and their effect upon the demand for American agricultural products are discussed.

European competition in agricultural production, with special reference to Russia, M. EZEKIEL (*Jour. Farm Econ., 14 (1932), No. 2, pp. 267–281, figs. 2*).—This is a review of the foreign competitive situation. It leads to the conclusions that "competition in the sale of agricultural products on foreign markets will continue as keen as ever. Severe restrictions on trade will continue or increase so long as prices remain low or declining. Until world economic

and political policies are changed, much of the competition will be senseless from an economic point of view, for the highest-cost producers will be encouraged to expand, while the lowest-cost producers will be compelled to reduce and make the needed adjustments," and that "more than any other nation, the United States has the power to take steps to correct the conditions which now are steadily strangling international trade. Until those steps are taken, it may be impossible to restore world confidence in the future. The level of prices can not be restored until a sound basis for confidence has been created. Both in domestic markets and in foreign markets, the prices of agricultural exports reflect the lack of confidence and the extreme competition which it produces. As yet, however, there are no signs of effective action to restore international trade."

Effects on American agriculture of a duty on Philippine coconut oil and copra, P. G. WRIGHT (*Jour. Farm Econ., 14 (1932), No. 2, pp. 311–318*).—The competition of margarine with butter and the qualities of other animal fats and cottonseed, peanut, and soybean oils produced and used in the United States are discussed. The conclusion is reached that a duty on Philippine coconut oil "would not appreciably aid the dairymen by improving the price of butter, nor agriculture in general by affording a greater diversity of crops to the farmer."

Neighborhood distribution and consumption of meat in Pittsburgh, J. H. COVER (*Chicago: Univ. Chicago Press, 1932, pp.* [7]+228, *figs. 6*).—This study was made in eight neighborhoods with characteristics representative of the various population groups of Pittsburgh and in one central retail area "to obtain some insight at close range of the habits, preferences, and processes of buying and selling food, as related to other social and economic phenomena." Analysis is made of the relationships between meat consumption and "family income; size of family; national, racial, and religious tradition; occupation and employment; other items in the food budget; shopping methods and distances; household tasks; housekeeping experience; period of residence in the United States and at the present address; [and] rationality of consumer purchases.

"Retail meat distribution has been approached from the following points of observation: Price variations and spreads, profit margins, relation of 'markets' to other food outlets, merchandising methods, customer action in store, products handled, purchasing methods, store condition and equipment, [and] sanitation."

An appendix includes the forms and instructions used in making the study.

Truck and rail transportation of Nebraska livestock to the Omaha market, B. S. WENDT and H. HEDGES (*Nebraska Sta. Bul. 275 (1932), pp. 31, figs. 4*).—The growth from 1920 to 1931 in the percentages of receipts of cattle, hogs, calves, and sheep arriving by truck; the origin, by zones, of Nebraska shipments by rail and truck of cattle, hogs, and sheep during a week in May, 1931; the average truckage rates, August 1, 1930, to July, 1931, by zones; and the effect of truck and rail rates, grades of highway and of rail connections, terminal differentials, transit insurance and relative risks by the two methods of shipment, attitude of buyers, convenience, flexibility, and shrinkage as factors influencing the choice of the method of transportation are discussed. Comparison is made of the approximate cash costs, by rail and by truck, of transporting hogs from the farm to market from shipping points approximately 40 and 160 miles from Omaha.

Operating practices of farmers' cooperative elevators in Colorado, D. N. DONALDSON and P. V. HEMPHILL (*Colorado Sta. Bul. 397 (1932), pp. 63, figs. 11*).—This study was in cooperation with the U. S. D. A. Bureau of Agricultural

Economics. Comparisons are made of the forms of organization and operating methods and practices of a selected group of farmers' elevators located in the northeastern part of the State in one of the principal grain-growing sections.

At 19 stations where 45 per cent of the elevators were owned by farmers, their elevators bought and sold approximately one-half of the grain. Practically all of these elevators handled side lines at a small profit, including coal, feed, seeds, flour, gasoline, oil, machinery, livestock, and beans. These side lines involve credit accounts which are causing concern, especially during this depression.

To operate on a consistently low per bushel cost, it is held that a farmers' elevator should handle at least 175,000 bu. and would have a better chance for success if it handled upwards of 300,000 bu. per annum. The majority of the Colorado farmers' elevators are in a conservative position relative to working capital, and they have a sufficient volume of grain. Profit margins realized on grain and side lines are also, in the main, satisfactory. Margins on side lines are often lower than could be maintained if these items were not handled in connection with the elevator business.

The bulletin concludes with a number of recommendations concerning the organization, operation, and business management of farmers' elevators; a bibliography; and two appendixes, one showing the forms used in connection with the study, and another the method of presenting the business analysis to the officials of the elevators.

An economic study of the organization, finance, and operations of farmers' business cooperatives in Vermont, H. C. GRINNELL (*Vermont Sta. Bul. 346 (1932), pp. 103, figs. 14*).—Data for this study, made in cooperation with the Federal Farm Board, were obtained in 1930 regarding the organization, finances, and operations by visits to the offices of all farmers' business organizations in the State. Additional information regarding the volume and type of business, organization and set-up, membership, labor, and similar subjects was obtained by questionnaires.

The development of farmers' organized business associations in the State is described. The study deals chiefly with 34 dairy marketing associations and 4 purchasing associations. The analysis covers the volume and type of business in 1929, the capital structure, purposes of organization, cooperative features, membership relations, personnel and management, business policies, and the balance sheet and purchasing items of the two groups. The current tendencies among the cooperatives and the factors affecting the service to patrons are discussed. Some of the findings of the study were as follows:

The operating costs in 1929–30 of the 4 purchasing associations absorbed 4.3 cts. out of each dollar of net sales, half being spent for salaries and wages. Apparently each additional $100,000 of sales was associated with a reduction of 1 ct. per dollar of sales in the operating expenses. Total operating expenses of creameries varied widely among the associations, but averaged 13.6 per cent of the net sales and 43 cts. per 100 lbs. of milk or its equivalent in cream handled. No direct relationship was found between volume of milk handled by the dairy marketing associations and the cost of operation. Operating costs of butter factories were lower than those of milk shipping stations, but the net sales per 100 lbs. of milk and the prices paid patrons were also lower. Among the butter factories, no significant relationship existed between operating expenses and volume of business.

Among the cooperatives whose main enterprise was the bulk shipment of fluid milk, operating costs of the large associations were definitely higher than those of the relatively small associations, due to the facts that the larger

associations carried more than their proportionate share of the surplus milk and that their operations were extended over a correspondingly large area. Associations operating unit plants with sales ranging from $300,000 to $400,000 shipped a higher percentage of their receipts in fluid form, sold their output at a higher average price, operated at lower costs, and paid higher prices to patrons than either the larger or smaller milk shipping associations. The cooperative group as a whole successfully met competition in the country in 1929, and it appeared that the weighted average fluid price paid by the 18 cooperatives that handled milk was below the New England Milk Producers' Association price during January, February, and March, and above it during the rest of the year. The average monthly price of 10 cooperatives exceeded and that of 8 fell short of the average price paid by Boston dealers, the average differential in favor of the cooperatives being 6 cts.

RURAL SOCIOLOGY

Methods in social science, edited by S. A. Rice (*Chicago: Univ. Chicago Press, 1931, pp. XIII+822, figs. 7*).—This case book, compiled under the direction of the committee on scientific method in the social sciences of the Social Science Research Council, is a very important contribution to the subject of methodology in the social sciences. It comprises a series of interpretations of the scientific methods employed by authors of significant social science literature. In most, though not all, instances the interpretations are case analyses.

The social economics of agriculture, W. Gee (*New York: Macmillan Co., 1932, pp. X+696, figs. 13*).—Designed for students, the book is a synthesis of the several social contributions to agricultural knowledge—economic, sociolgical, historical, and governmental. Agriculture is viewed as a basic phase of national life. To attain prosperity, both rural and urban interests must be equally considered and directed into sound and effective functioning. As the Nation has become primarily urban and industrialized, an indifference to the interests of farming people on the part of the majority element presents great dangers. Through education, urban people should be informed of the problems of agriculture and their vital relationship to the prosperity and welfare of the city. The rural minority must also be educated concerning the important bearing of urban, industrialized interests upon the agricultural group. Out of such a common understanding should come a balanced program of development in the economic and social structure of American civilization.

The book is divided into six sections. In the first section, five chapters are devoted to the agricultural problem. In the second section, nine chapters are devoted to economic considerations, such as farm management, land utilization, ownership and tenancy, labor and wages, credit, insurance, marketing, and prices. In the third section, nine chapters are devoted to social factors, including rural physical environment, population trends, standards of living, health, recreation and art, public welfare, farm youth, community organizations, and leadership. In the fourth section, three chapters are devoted to farmers' organizations, including their development, the U. S. Department of Agriculture and related institutions, and agricultural extension work. In the fifth section, three chapters are devoted to political problems, including the farmer and government, the tariff and agriculture, and farm taxation. In the final section, five chapters are devoted to rural institutions, including the small town, the farm family, the farmer and his church, the county library and country newspaper, and country schools.

Research in rural sociology, O. D. Duncan (*Oklahoma Sta. [Bien.] Rpt. 1931–32, pp. 205, 206*).—Previously unpublished results indicate that low income,

low net wealth, and low tenure status retard the social and educational advancement of farmers. Factors tending to control the farmer's expenditures for health maintenance were heavy current farm operating costs and expenditures for food, clothing, and household operation.

Some relationships of the variable, cash expenditure for farm family living, C. E. Lively (*Ohio State Univ., Dept. Rural Econ. Mimeogr. Bul. 36 (1931), pp. [1]+22*).—This bulletin reports certain of the more technical aspects of the study of the expenditures for living and related factors, based on 187 account-book records of Ohio farmers, previously noted (E. S. R., 64, p. 574).

All major types of cash expenditure for living were found to increase as total cash receipts increased up to $4,500–$5,000, after which expenditure for living tended to become constant, thus revealing the upper limits of the conventional class standards of rural living and the consumption limitations of the rural environment. Considered from the point of view of predicting cash expenditure for living, the adult male equivalent for food was a better measure of size of household than Kirkpatrick scales of cost-consumption units (E. S. R., 50, p. 294; 54, p. 885). Expenditure per adult male equivalent correlated more closely with receipts than did expenditure per cost-consumption unit.

The relations and coefficients noted below are on the basis of adult male equivalent for cash expenditure for living and total cash receipts. Value of food and fuel furnished by the farm reduced to adult male equivalents gave virtually a zero correlation with cash expenditure for living. The correlation coefficient for expenditure for living and capital possessed expressed in terms of adult male equivalents was 0.46. That for capital and total cash receipts was 0.76. The coefficient of multiple correlation was 0.60. No significant relation was found between age of operator and home maker and cash expended for living. Schooling of operator and home maker was significantly related to both cash expenditure for living and total cash receipts (coefficients 0.36 and 0.27, respectively). Little or no evidence was found that education of children exerted any important influence on the standards of living of the family.

There was a significant relation between number of newspapers and magazines received and total cash expenditure, but it was not sufficiently high to give it much validity as an index of cash expenditure for living. The relation to total cash receipts was very low. The correlation coefficient for the relation of average schooling of operator and home maker to the number of newspapers and magazines received was 0.28. Average number of hours per week spent in reading was no more closely related to expenditure than was the number of newspapers and periodicals received. The relation of number of conveniences possessed to total cash expenditure was significant (coefficient= 0.38); that to total cash receipts was lower (0.16). The amount invested in furniture correlated with total cash expenditure for living, and with total cash receipts gave coefficients of 0.30 and 0.22, respectively, indicating that it is of little value as a predictive factor. The index of family organization relationships (based on membership, attendance, financial contributions, and positions of leadership) correlated with total cash expenditure gave a coefficient of 0.26, and that with total cash receipts was 0.06. The correlation between (1) a selected list of play facilities for children and (2) total hours of labor on domestic industry and total cash expenditure for living showed no significant relations.

Multiple correlation of cash expenditure for living per adult male equivalent with the more significant variables (total cash receipts, average schooling of operator and home maker, number of conveniences possessed, and index of organization relationships) gave a coefficient of 0.70.

Of the families studied, 47 kept continuous records for two or more years, Coefficients of variation were computed for interyearly variation (1926–27 and 1927–28) and the variation between families in 1927 in total cash receipts, cash expenditure for living, and size of household. These showed (1) the variation in cash expenditure to be less than that for total receipts, (2) the interyearly variation for living expenditure to be less than the interfamily variation, (3) a greater stability of interyearly variation for living expenditure than for total receipts, and (4) a less variation in size of household from year to year than in either receipts or expenditure for living.

A table is given showing the coefficients of variation of the major budgetary between years in the same families and between families in the same year.

To determine the effect of using more than one record from the same family upon the general results of the study, comparison is made of the correlation coefficients and standard deviations for the four chief variables obtained, using all records (179 cases including 67 repeaters) and using the 112 cases of single records per family. The addition of the 67 repeater records raised three of the coefficients and reduced one, but the changes were not great enough to place them outside the limits of error. The standard error for each coefficient was reduced by including the repeater records.

The growth cycle of the farm family, C. E. Lively (*Ohio State Univ., Dept. Rural Econ. Mimeogr. Bul. 51 (1932), pp. 22, fig. 1*).—The characteristics of Ohio farm families reported upon in this analysis of data collected in 8 representative sample areas are size, composition, and developmental changes in the families studied in relation to age at marriage, duration of marriage, and size of farm business.

Rural intelligence in relation to rural population, C. D. Lewis (*George Peabody Col. Teachers [Nashville], Contrib. Ed. 74 (1929), pp. [IX]+88, figs. 7*).—This is a synthesis of data bearing upon the question of whether rural population is qualitatively self-sustaining. The conclusion is reached that there is a tendency, though not large, for rural communities to perpetuate themselves from their lower intelligence levels and thereby give a downward trend of average native ability to the succeeding generation. Encouragement is found in the fact that in the communities studied the group of high school students expressing a choice for farming includes a higher percentage of the superior and very superior individuals than does the group who wish to leave the farm. Those who move from country to city represent two distinct types. One type, of higher intelligence, goes into business and professional life, while the other, of lower intelligence, goes into trades, clerical positions, and industrial employment. The further conclusion is reached that many people of superior intelligence are still born on the farms, and that quite a fair proportion of them seem inclined to remain there. By the improvement of educational and other rural facilities, it is believed that the rural home and community may be enabled to enjoy practically every modern comfort, luxury, and cultural influence that can be possessed by the city. Thus the prospect to stay the tendencies that would lower the high type of rural manhood and womanhood seems bright.

Rural industries in Knott County, Kentucky, W. C. Nason (*U. S. Dept. Agr., Bur. Agr. Econ., 1932, pp. [2]+24, pls. 2*).—The study here reported in mimeographed form was conducted in cooperation with the U. S. D. A. Bureau of Home Economics and Forest Service and the Kentucky Experiment Station, as part of an intensive economic and social survey of the southern Appalachian highlands. Knott County, Ky., the area reported upon, is part of the Cumberland Plateau and typical of the "creek bottom" settlements of the

Kentucky mountain area. The rural industries studied are weaving, basket making, furniture making, sawmilling, gristmilling, coal mining, blacksmithing, and stone quarrying. In this and other mountain areas, where farming is necessarily self-subsistent, rural industries are the source of most of the cash income. It is thought that these industries, if properly supervised, are capable of greater development.

European Conference on Rural Hygiene.—Report of the preparatory committee on the principles governing the organisation of medical assistance, the public health services, and sanitation in rural districts (*Geneva: League of Nations, Health Organ., 1931, pp. 62*).—The conference, called by the Council of the League of Nations, met at Geneva on June 29, 1931. The agenda proposed by the health committee included guiding principles and suitable methods for providing effective medical assistance in rural districts, the most effective methods of organizing the health services in rural districts, and the most effective and economical methods of sanitation in rural districts. Groups of experts reported on each of these items of the agenda.

The first four chapters cover the résumé of the proposals of the preparatory committee and the reports of the experts. A fifth chapter is a report of the International Labor Office on sickness insurance as a factor in rural hygiene and on agricultural workers' housing.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Determining the agricultural constants in a preparatory curriculum for high school teachers of agriculture in Georgia, J. T. Wheeler (*Ga. Agr. Col. [Bul.] 418 (1931), pp. [2]+151, figs. 35*).—This study is "directed toward (1) discovering the elements of farming that are common to all vocational teachers of agriculture in the State, (2) analyzing these common elements until working descriptions of them are evolved and stated, and (3) selecting appropriate criteria for evaluating these constant problems in terms of preparatory curricular units for high school teachers of agriculture." The likenesses and differences in agriculture in the different soil areas of the State, the distribution of teachers of agriculture, types of farming and their distribution, farm practices on 101 cotton farms, and practices with farm animals on 67 farms were studied.

As a result of the analysis the following factors are selected as bases of judgment in choosing agricultural problem content in a preparatory curriculum for teachers of agriculture: (1) Unity and coherence, (2) significance, (3) probability, (4) type unit, (5) proved superior merit, (6) immediate need, and (7) sufficient possession. The nature of the curricular units determined by applying these factors to the agricultural constants are outlined.

Adult education in agriculture through evening schools conducted by departments of vocational agriculture, B. H. Fleenor (*Topeka: Kans. State Bd. Vocat. Ed., 1932, pp. 114, figs. 7*).—This study, published jointly by the Kansas State Board for Vocational Education and the division of extension of the Kansas State College, brings together some of the more important facts bearing on the agricultural evening school in a group of 21 States in which Missouri is centrally located. The data were obtained from information blanks returned by 518 of the 726 evening-school teachers in the States in the school year 1929-30. The subjects covered in the analysis are the background and experience of the typical teacher, the organization of the schools, characteristics of the students enrolled, teaching methods, extent of supervised practice, the more general results of the schools, and the specific results in terms of improved farm practices adopted by the students.

[Fourteenth, fifteenth, and sixteenth annual reports of the Federal Board for Vocational Education, 1930–1932,] (*Fed. Bd. Vocat. Ed. Ann. Rpts., 14 (1930), pp. XI+129, figs. 16; 15 (1931), pp. XI+129, figs. 16; 16 (1932), pp. X+117, figs. 18*).—These reports continue the series previously noted (E. S. R., 62, p. 685) and cover the years ended June 30, 1930, 1931, and 1932. Each report includes a review of the work in agricultural, trade and industrial, home economics, and commercial vocational education; of Federal participation under State programs of vocational rehabilitation; and of the District of Columbia vocational rehabilitation service. Each report also includes statistical and financial tables covering the work under the acts providing for Federal cooperation with the States and Territories in promoting vocational education and vocational rehabilitation of disabled civilians.

Plant biology, H. Godwin (*Cambridge, Eng.: Univ. Press, 1930, pp. [XI]+265, figs. 71*).—"While based on elementary lectures given to first year medical students and designed primarily for their use, the book is intended to have also a wide utilization by other biological students of similar status. It should be suitable for use in the higher forms of those schools in which biology is taught and in the introductory classes of training colleges. . . . Whilst most of the textbook is intended to give the student direct access to biological fact and outlook, its limited size and wide scope together have made the book one which, in the author's view, is well suited to expansion and illustration by teacher or lecturer. This applies especially to the parts of the book which deal with what we may call the chemical background of plant physiology. . . . As the book has not been written for use by students of less than 16 or 17 years of age, it has seemed permissible to assume in the reader some elementary knowledge of physics and chemistry."

Motion pictures of the United States Department of Agriculture, 1932 (*U. S. Dept. Agr., Misc. Pub. 152 (1932), pp. II+32*).—This is a classified list of the motion pictures available, with information as to how they may be obtained on loan or by purchase.

FOODS—HUMAN NUTRITION

[Food studies of the Illinois Station] (*Illinois Sta. Rpt. 1932, pp. 231–239, 244, 245, figs. 3*).—Studies by J. Outhouse and L. Merritt deal with the favorable effects of lactose on the deposition of ash in the bones of experimental rats; by S. Woodruff (1) with the chemical composition and baking (E. S. R., 66, p. 290) qualities of flours from various soft and hard wheats, (2) with the usefulness of a new type of shortometer, which is described and illustrated, for judging the relative values of different shortenings by the breaking strengths of thin crisp wafers prepared under standardized conditions, and (3) with the nature of the gels and the microscopic appearance of the starch grains in soft and hard wheat flours before and after heating, using the method of Woodruff and Nicoli (E. S. R., 66, p. 201); by Woodruff and O. Zwermann on the utilization of soybean oil as human food; and by H. T. Barto and S. C. Munger on the reduction of overweight by dieting (E. S. R., 66, p. 294).

Low-cost food for health, M. Henry and D. Monroe (*N. Y. Agr. Col. (Cornell) Ext. Bul. 236 (1932), pp. 10*).—This popular bulletin contains practical advice on choosing, buying, and using food wisely when the family income is low, including suggestions as to what should come first when there is not enough money to buy all of the food the family should have. Sample low-cost menus are given, with suggestions for substitutes, for breakfast, lunch or supper, and dinner.

It pays to buy food wisely, D. Monroe and M. Henry (*N. Y. Agr. Col. (Cornell) Ext. Bul. 237 (1932), pp. 38*).—To meet the emergency of lowered

incomes with the resulting necessity of cutting food expenditures, suggestions for saving in food buying have been assembled from the experiences of skilled household buyers and from impersonal studies of marketing. Specific information of aid to the purchaser is also given on grades of milk and cream; types and relative costs of cheese; butter scores and grades of eggs; the relative costs of different units of bread, cereals, and prepared flours; grades of meat and cuts of meat to choose for different purposes, with the number of servings from customary weights of different cuts; varieties of fruits; grades of different fruits, fresh and dried, and of fresh vegetables; and the different grades and contents of different sized cans of canned fruits and vegetables.

Corn: Ways of using as a low-cost food, S. Woodruff (*Illinois Sta. Circ. 399 (1932), pp. 16*).—This circular, prepared especially to promote the use of home-produced corn in the diet as a low-cost food, contains suggestions as to the Illinois varieties best suited for home use, general directions for cooking whole corn, cracked corn, and corn meal and for making lye hominy, and tested recipes and menus.

The comparative composition of brown and polished rice: The losses in material due to polishing, J. A. LeClerc (*Cereal Chem., 9 (1932), No. 6, pp. 600–602*).—Proximate analyses are reported for five samples of brown rice and the corresponding samples of polished rice from the same lots and one sample each of brown and polished glutenous rice, all from Japan. The glutenous rice is a form of Japanese rice not on the American market to any appreciable extent. The average values for the five samples of brown and polished rice on a moisture-free basis were fat 2.45 and 0.37, crude fiber 0.88 and 0.16, ash 1.22 and 0.36, protein (N×6.25) 8.67 and 8.15, and carbohydrates 86.70 and 90.79 per cent, respectively, and the moisture contents 9.26 and 9.37 per cent.

These data, together with previously published data on the composition of rough rice or rice in the hull, are used in estimating the material removed during the process of polishing the annual rice crop of the United States and thus lost to human consumption. Among these losses are listed approximately 5,000,000 lbs. of phosphorus. Attention is also called to the fact that the process removes the so-called aleurone layer especially rich in proteins, vitamins, and minerals.

It is noted in conclusion that although in this country polished rice is regarded as having better keeping qualities than brown rice, in Japan rice is stored in the form of brown rather than polished rice.

Photochemical action, a cause of rancidity, M. R. Coe and J. A. LeClerc (*Cereal Chem., 9 (1932), No. 5, pp. 519–522*).—This is a more complete report of the investigation noted previously from a preliminary report (E. S. R., 68, p. 125). The main portion of the visible spectrum which was found to prevent the development of rancidity in foods was found to lie between 4,900 and 5,600 a. u. Selective ultra-violet light hastened the development of rancidity as compared with natural sunlight. In the absence of light, air circulated through rice bran, with or without the presence of metallic catalysts or excessive moisture, did not produce rancidity. Excluding air did not prevent the development of rancidity in an unwrapped sample of rice bran, while a corresponding sample wrapped with black paper was free from rancidity after several months.

The authors conclude that "black or green containers are a practical and effective means of protecting from spoilage food materials subject to certain types of rancidity."

Quick freezing of vegetables for market (*New York State Sta. Rpt. 1932, pp. 103, 104*).—This progress report deals chiefly with varieties of peas and sweet corn best adapted to preservation by quick freezing and with methods of

harvesting and processing peas to yield the most satisfactory products on quick freezing.

After the hunt, R. H. Stone (*Hygeia [Chicago], 10 (1932), No. 11, pp. 984–987, figs. 3*).—This article includes recipes for various forms of game, including venison, pigeon, rabbit or squirrel, wild duck, pheasant, quail, and squab. Recipes are also given for appropriate sauces, jellies, and dressing for game.

An anthropometric method for arriving at the optimal proportions of the body in any adult individual, D. P. Willoughby (*Res. Quart., 3 (1932), No. 1, pp. 48–77, figs. 3*).—This paper describes in considerable detail the development of an anthropometric method for determining the optimal horizontal girth and diameter measurements, skeletal and fleshy, of the adult body—male and female. The reliability of the method is considered somewhat greater at present for males than for females.

In the opinion of the author "the relative proportions of the human figure are of far greater physiological significance than is the mere measure of its total bulk. Weight, therefore, should be considered secondarily to the interrelationship in size of the various linear (girth and diameter) measurements of the body."

Optimal weight estimation: The method of Willoughby, E. K. Shelton (*Endocrinology, 16 (1932), No. 5, pp. 492–505, figs. 6*).—The application of the Willoughby anthropometric method noted above to the estimation of optimal weight of adults is explained, and its clinical possibilities are discussed, with illustrative case reports. On the basis of actual experience in the use of the method for more than two years, the author states "it is believed to have distinct advantages over the height-weight-age scales now in use and to be conducive to better management of the weight problem in clinical practice. Although there are many technical difficulties to be surmounted in the ultimate perfection of such a method, it is considered of sufficient importance to warrant careful study."

Basal metabolism.—I, The error of basal metabolism determination and the normal range of basal metabolism. II, The basal pulse complex, R. L. Jenkins (*Arch. Int. Med., 49 (1932), No. 2, pp. 181–187, figs. 2; 188–198, figs. 3*).—The first of these two papers covers essentially the same ground as one noted previously from another source (E. S. R., 66, p. 890). In the second, original data obtained in the metabolism laboratory of the University of Chicago clinics have been used to develop formulas and tables for the calculation of a basal pulse complex which is comparable with the basal metabolism of adults. "This measure should be of value as a procedure supplementary and confirmatory to basal metabolism determination in the diagnosis of metabolic disease."

Further observations on the basal metabolism of Australian aborigines, H. S. H. Wardlaw and W. J. Lawrence (*Aust. Jour. Expt. Biol. and Med. Sci., 10 (1932), No. 3, pp. 157–166, fig. 1*).—Basal metabolism determinations by the same technic as in an earlier study (E. S. R., 60, p. 894) were made at the end of winter on 11 full-blooded male Australian aborigines, 9 of whom were engaged in regular work.

The average basal metabolism of the 9 active subjects was 91 per cent of the Du Bois standards and of the 2 subjects not employed in any way 67 per cent of the standards. The latter values correspond most closely to those reported in the previous study. It is concluded that "under conditions of physical inactivity the aborigines' basal metabolism of these subjects sinks to values considerably below those observed among white subjects."

The diets of college women in relation to their basal metabolism, C. M. Coons and A. T. Schiefelbusch (*Jour. Nutrition, 5 (1932), No. 5, pp. 459–465*).—In an attempt to find an explanation for the low basal metabolism of normal

women in Oklahoma, noted in a previous report (E. S. R., 66, p. 890), the authors have analyzed the self-chosen diets of 18 normal college women from the same institution and the experimental diets of 2 others. The methods followed in the sampling and analyses were those described in a previous paper by the senior author (E. S. R., 64, p. 492). The basal metabolism tests were made on all the subjects just before the dietary study.

In the tabulation of data on the relation between basal metabolism and caloric intake, the cases were arranged in descending order of body weight. Only 3 of the 17 subjects included were overweight, the average deviation from normal being —9 per cent. The deviations from the Du Bois standards for basal metabolism were all negative with one exception, which was the same as the standard. No relation was evident between the extent of underweight and of deviation from standard. The average basal metabolism was 1,193 calories per 24 hours, representing a deviation from the Du Bois standard of —12 per cent. There was no relation between caloric intake and deviation from normal weight. The average daily intake was 1,990 calories, or 38 calories per kilogram of body weight, representing an average excess of 796 calories over basal, an excess considered barely within the lower levels of adequacy.

The protein content of the diets was even less adequate in quantity and quality. The average consumption was only 1.1 g per kilogram of actual weight, or 0.97 g per kilogram of ideal weight. The calcium intake averaged 0.93 and the phosphorus 1.19 g daily. The diets of subjects with higher basal metabolism values were no higher in protein or calories than those with low values. The most underweight subjects tended to have the lowest mineral intake.

Attention is called to one set of figures representing the house diet of a sorority. The subject was 14 per cent underweight, and had a basal metabolic rate of —7 per cent and a caloric intake of only 537 calories in excess of basal. Her protein intake was 0.8, calcium 0.52, and phosphorus 0.87 g per kilogram of body weight. It is noted that in this group of students "in the course of a year there was discovered one case of pellagra, two cases of tuberculosis, and a number of cases of marked undernutrition. Girls content to live on such a diet doubtless were unaccustomed to home diets which differed greatly."

For comparison with these figures, similar data are given for 3 other subjects, 1 of whom was a northern woman who had been in Oklahoma only 3 months and was 13 lbs. underweight at the time, but was gaining at the rate of about 1 lb. per week. The other 2 were on a constant diet which had been followed, with an intermission of 1 week, for a period of 42 days. One of these had been a subject in the first series. The basal metabolic figures were as low as in the first series (—8.5, —15.9, and —18.1 per cent, respectively). The caloric intakes were much higher (3,080, 2,565, and 1,953 calories per 24 hours, respectively), representing an excess over basal of 140, 106, and 71 per cent. The protein values were 1.4, 1.3, and 1 g, respectively, per kilogram of body weight.

The authors draw the tentative conclusion that prolonged undernutrition is one factor in many of the cases of lower metabolism, and that "2,000 to 2,500 calories daily, or at least 1,000 calories in excess of basal metabolism, is a desirable intake for average women of this age and activity. However, more will be needed if weight is to be added or the basal metabolic rate is to be raised."

The dietary needs of the southern woman during pregnancy, C. M. Coons (*Oklahoma Sta. [Bien.] Rpt. 1931–32, p. 177*).—Supplementing the study

previously noted (E. S. R., 68, p. 412), preliminary findings are reported, with particular reference to retention of calcium.

Dietary deficiency of fat-free diet for rats. U. Tange (*Imp. Acad. [Japan], Proc., 8 (1932), No. 5, pp. 190–193, figs. 3*).—Preliminary results are reported, with photographic illustrations, of the effect on rats of a highly purified fat-free diet with and without certain pure fatty acids. The rats on the basal diet alone developed a pathological condition resembling pellagra and were rapidly cured by the administration of from 2 to 3 drops daily of linoleic acid. Rats receiving oleic instead of linoleic acid grew at approximately normal rate, but developed slight symptoms resembling the more severe pellagra-like symptoms on the basal diet.

Do children who drink raw milk thrive better than children who drink heated milk? L. C. Frank, F. A. Clark, W. H. Haskell, M. M. Miller, F. J. Moss, and R. C. Thomas (*Pub. Health Rpts. [U. S.], 47 (1932), No. 39, pp. 1951–1960, figs. 5*).—This question was attacked by an extensive field survey in 10 different States of the health history, height and weight, and diet of over 3,700 children from 10 months to 6 years of age. The data were assembled in two groups, one comprising children who had received raw milk and the other those who had received heated milk more than half of their lives, including the latter half.

There was no significant difference between the average weights of the children of the two groups, 33.6 lbs. for the heated milk and 33.2 lbs. for the raw milk group. This was also true of the average heights, which were 37.5 and 37.4 in., respectively. Information secured on the relative percentages of life during which various supplementary foods were included in the diet showed no significant differences between the two groups except in the case of cod-liver oil, which was included during an average of 41.6 per cent of the lives of the children receiving heated milk and only 27.6 per cent of the lives of the children receiving raw milk. This difference was thought not to affect the relative positions of the two age-weight curves significantly, inasmuch as the average weights of the children in the heated milk group receiving and not receiving cod-liver oil were almost identical, 33.8 and 33.5 lbs., respectively.

Higher incidences of diphtheria, scarlet fever, intestinal disturbances, and rickets were recorded for the children in the raw milk than in the heated milk group.

It is concluded that "the growth-promoting capacity of heated milk plus the supplementary diet received by the average American child of 10 months to 6 years is not measurably less than the growth-promoting capacity of raw milk plus the supplementary diet received by the average American child of 10 months to 6 years."

Studies on magnesium deficiency in animals.—II, Species variation in symptomatology of magnesium deprivation, E. R. Orent, H. D. Kruse, and E. V. McCollum (*Amer. Jour. Physiol., 101 (1932), No. 3, pp. 454–461, figs. 2*).—Young dogs on a ration containing only 1.8 parts per million of magnesium but adequate amounts of other known dietary constituents were found to show the same symptoms, although in different degree, as rats on the same deficient diet, as described in the first paper of the series (E. S. R., 68, p. 131). "In the dog the vasodilatation, hyperexcitability, and convulsions are less intense, while the trophic and nutritive changes are relatively more conspicuous than in the rat because inherently the nervous system of the dog is more stable."

In both species death occurred from convulsions. The findings in the present series are thought to afford additional evidence that the symptom complex of

magnesium deficiency "is tetany, differentiated from other forms principally but not solely by the vasomotor spasm."

The effect of a high intake of manganese on the growth of rats, J. T. SKINNER (*Jour. Nutrition, 5 (1932), No. 5, pp. 451–457*) —In view of conflicting results reported in the literature on the effect of added manganese on the growth of rats, an earlier study on the manganese metabolism of rats in which retarded growth was noted (E. S. R., 65, p. 490) was supplemented by further observations on growth and lactation records on a high intake of manganese. The diet differed from that of the earlier study only in the substitution of whole milk ad libitum for milk powder. In one series of experiments the manganese was fed in amounts of 10 mg daily to female rats during pregnancy and lactation, and observations were made of the weights of the young, reduced to six per litter, at various intervals from birth to weaning at 21 days. In another series young rats were fed from weaning for a period of 12 weeks additional manganese equivalent to 2,000 parts per million of the ration. In both series controls without manganese showed no superiority over those receiving manganese.

It is concluded that the slower growth of the rats in the earlier study was not due to toxicity of manganese but to a less suitable source of milk solids.

Manganese as a factor in reproduction, J. T. SKINNER, E. VAN DONK, and H. STEENBOCK (*Amer. Jour. Physiol., 101 (1932), No. 4, pp. 591–597, figs. 2*).—The tentative conclusion, based upon preliminary experiments, that manganese greatly improves the ovulation rhythm of rats on a milk-copper-iron diet (E. S. R., 66, p. 89) was subjected to further test with larger numbers of animals and controls, with the conclusion that although female rats reared on milk fortified with copper and iron do not attain sexual maturity as early as those receiving the same ration supplemented with manganese, the addition of manganese does not result in normal oestrous cycles. A greater percentage of the animals receiving manganese exhibited oestrum three or more times, but there were some controls receiving no manganese which had as satisfactory records as any receiving manganese.

In an effort to determine the cause of the failure of oestrum on a milk diet supplemented with iron and copper, four different types of supplements were tested, (1) a food mixture consisting of liver, yeast, egg yolk, cod-liver oil, and wheat germ oil, designed to supply additional energy, potent sources of the known vitamins, and an animal food rich in minerals; (2) head lettuce to furnish supplementary minerals and vitamins; (3) sucrose and manganese; and (4) sucrose alone. The least effective of these supplements was lettuce. With the food mixture supplements, oestrum occurred at intervals of 5 days, with sucrose 5.4 days, and with sucrose and manganese 4.3 days, or the normal interval. These results are thought to indicate that "for normal oestrum the prime deficiency of the milk-iron-copper ration is that of the energy."

The action of copper in iron metabolism, C. A. ELVEHJEM and W. C. SHERMAN (*Jour. Biol. Chem., 98 (1932), No. 1, pp. 309–319, figs. 2*).—This paper reports a study of the changes brought about in the iron content of the liver and spleen of anemic rats when copper is added to the diet.

When iron was fed as purified $FeCl_3$ daily, in amounts furnishing 0.5 mg Fe, for a period of 2 weeks to rats rendered anemic according to the technic of Elvehjem and Kemmerer (E. S. R., 67, p. 90) there was no increase in the amount of hemoglobin in the blood, but the total iron in the liver increased from an average of 0.12 to 0.46 mg and of the spleen from 0.024 to 0.068 mg. In other rats which had received the same iron dosage substituted at the end of 2 weeks by 0.05 mg of copper daily, the average increase in hemoglobin for

the next two weeks was 2 g, while the iron content of the liver had dropped to approximately the same level as before any iron was fed. But little change took place in the iron content of the spleen, but there was a definite increase in its size.

In rats continued on milk alone after the two weeks of iron feeding, there was some loss of iron in the liver, but not nearly as great as when copper was fed. Organic iron in the form of hematin was less readily stored in the liver than inorganic iron. This is thought to explain the inferiority of organic iron to inorganic for hemoglobin regeneration, as noted previously by Elvehjem (E. S. R., 67, p. 479).

When graded levels of inorganic iron were fed with and without copper to anemic rats for 14 days, the rate of hemoglobin formation was found to depend upon the iron intake, but there was no increase in the iron content of the liver until 0.3 mg of iron was fed daily.

These results are discussed in the light of reports of others, including Williamson and Ets (E. S. R., 59, p. 392) and Josephs (E. S. R., 68, p. 128). "All these workers reached the same general conclusion, namely, that copper mobilizes the iron in the liver, but the results in this paper give a definite account of the retention and utilization of inorganic iron in the absence and presence of copper."

The action of copper in iron metabolism (*Jour. Amer. Med. Assoc., 99 (1932), No. 25, pp. 2114, 2115*).—In this editorial comment on the paper of Elvehjem and Sherman noted above, a word of warning against possible excess in the administration of copper is sounded as follows:

"Copper is far more widespread in foods than may be commonly supposed. The need for copper is quantitively far smaller than the requirement of iron. The newer knowledge should not be accepted as a warrant for uncontrolled administration of copper compounds to man. The facts regarding the possible actual needs and function of this element in human physiology remain to be more definitely ascertained. Hematopoiesis is something more than mobilization of iron and copper. Destruction of blood cells is a process that may be initiated by independent causes. Enthusiasm for the new dicoveries must not be permitted to open the door to unfounded therapy."

Bibliographical survey of vitamins, 1650–1930, with a section on patents, M. H. Wodlinger, compiled by E. M. Salmonsen (*Chicago: M. H. Wodlinger, 1932, pp. [8]+334*).—This exhaustive bibliography is arranged chronologically. References from 1650 to 1910 are grouped together as a historical introduction to the vitamin theory. From 1911 to 1915, inclusive, the references are listed alphabetically by year, with no attempt at differentiating the then known vitamins. From 1916 to 1920, inclusive, the references are grouped under the headings vitamins A, B, C, and D, and general references. In 1921 the heading vitamin E appears for the first time. Apparently under this heading have been included references to the literature dealing with the relation of vitamins to reproduction regardless of whether vitamin E is involved or not. This tends to give an erroneous impression as to the significance of the term vitamin E. As stated by Sherman (E. S. R., 67, p. 768), "so far as may be judged at present, failures in reproduction encountered in the ordinary course of events are more apt to be due to shortage of other nutritional factors than of vitamin E."

A valuable feature of the volume is a section on vitamin patents, including 240 titles.

The entire list of references, as given in the summary of references by years, totals 11,338 titles, but in a number of instances the same reference is listed under more than one heading.

Recent researches on the nature and function of vitamins, I–IV, J. C. Drummond (*Jour. Roy. Soc. Arts, 80 (1932), Nos. 4161, pp. 949–957; 4162, pp. 959–965; 4163, pp. 974–980; 4164, pp. 983–990*).—These four Cantor lectures, delivered before the Royal Society of Arts, Great Britain, deal successively with the water-soluble vitamins, vitamin A, vitamin D, and practical aspects of the vitamins as they affect human nutrition. The remarkable advances which have taken place in the knowledge of vitamins and in the preparation of active concentrates since the author addressed the same society six years earlier (E. S. R., 55, p. 488) are emphasized by a table giving the dates of isolation or discovery of the various vitamins and the effective doses of the most active preparations of vitamins A, B_1, D, and E in 1926 and 1932, respectively. Concise accounts are given of present knowledge of the chemistry and physiological properties of the vitamins, and the final paper includes a tabulation of the qualitative occurrence of vitamins A, B_1, B_2, C, D, and E.

In conclusion the author suggests the importance of thoroughgoing dietary surveys of urban populations to obtain accurate information regarding the consumption of vitamin-containing foods. "The results would well repay the trouble and expense of the investigation, and would give us a surer 'base-line' for use in estimating the requirements of the people as a whole."

[Vitamin studies at the Illinois Station] (*Illinois Sta. Rpt. 1932, pp. 228–231*).—Progress reports are given on studies by C. R. Meyer and F. M. Roy dealing with the preparation of vitamin B concentrates from rice polishings for use in vitamin G testing and further studies on the distribution of vitamin B in the structural parts of yellow corn, by M. P. Thorp and Meyer on the value of yellow corn germs for lactation, and by Meyer and Roy on the relative potency of tomatoes, orange juice, and carrots to meet the vitamin G needs of lactation (E. S. R., 66, p. 296).

Vitamin studies, R. Reder (*Oklahoma Sta. [Bien.] Rpt. 1931–32, pp. 185, 186*).—This progress report (E. S. R., 64, p. 790) includes preliminary results in studies on the quantitative measurement of vitamins B and G and the rate of digestion and absorption of carbohydrate by rats on a diet deficient in vitamins B, G, or the vitamin B complex.

The effect of dietary deficiencies on phospholipid metabolism, B. R. Monaghan (*Jour. Biol. Chem., 98 (1932), No. 1, pp. 21–33, fig. 1*).—An extension of the investigation noted previously (E. S. R., 68, p. 131) to the determination of the phospholipid content of various organs of rats suffering from different vitamin deficiencies showed a marked decrease in the phospholipid content of the tissues, particularly the liver, irrespective of the type of dietary deficiency. This decrease was not accompanied in the A-deficient rats by a decrease in iodine number, as has been observed in the in vitro action of this vitamin. The author concludes, contrary to the suggestion in the previous paper, that there is no specific connection between vitamin A and phospholipid metabolism. On the other hand, the results do not support the theory that the phospholipid content of the cells is irreducible in amount and represents an indispensable part of the protoplasmic structure, but are entirely consistent with the view that the phospholipids act for the most part as intermediate products in fat metabolism.

Avitaminosis, VIII–X (*Soc. Expt. Biol. and Med. Proc., 29 (1932), Nos. 4, pp. 462, 463; 7, pp. 848–850*).—In continuation of the series noted previously (E. S. R., 68, p. 278), three papers are presented.

VIII. *Effect of vitamin B deficiency on concentration of non-protein nitrogen of blood,* B. Sure and M. C. Kik (pp. 462, 463).—No significant changes were observed in the concentration of nonprotein nitrogen in the blood of rats on

diets deficient in the vitamin B complex or in vitamin B alone as compared with matched litter controls on the same diet with dehydrated yeast as the source of the vitamin B complex and autoclaved yeast as the source of vitamin G, respectively. There were likewise no appreciable differences in the concentration of urea or uric acid.

IX. *Influence of vitamin A deficiency on albumin-globulin ratio of the blood of albino rat,* M. C. Kik and B. Sure (p. 463).—The possibility of a shift in the albumin-globulin ratio of the blood of rats in vitamin A deficiency was suggested by the general belief that infection accompanies vitamin A deficiency and the claim that during infection there is a change in the albumin-globulin ratio of the blood due to a rise in globulins. Data obtained from weekly determinations for periods ranging from 63 to 102 days on 12 vitamin A-deficient and 6 control rats showed in only 4 of the pathological animals any considerable fall in the albumin-globulin ratio, and this only during the terminal stages of the avitaminosis. It is concluded that the albumin-globulin ratio can not be used as an index of infection in vitamin A deficiency.

X. *Further studies on the effect of vitamin B deficiency on lipid metabolism,* B. Sure, M. C. Kik, and A. E. Church (pp. 848–850).—It is here reported briefly that further studies have not substantiated conclusions drawn in the third and fourth papers of the series that lipemia is a symptom complex of vitamin B deficiency. Irregularities in some of the earlier fatty acid determinations were traced to the influence of carbon dioxide emanating from a nearby gas burner. With suitable precautions to eliminate this contamination, irregularities were overcome and no appreciable changes were found in the concentration of fatty acids or cholesterol in the blood even in the final stages of B avitaminosis or in starvation. It is now thought that the lipemia observed in polyneuritic nursing young is probably of alimentary origin, but not specifically related to vitamin B deficiency.

Avitaminosis.—XI, The specific effect of vitamin B on growth as evidenced by the use of vitamin B concentrates, B. Sure (*Jour. Biol. Chem., 97 (1932), No. 1, pp. 133–139, figs. 6*).—The conclusions drawn in a previous paper (E. S. R., 67, p. 484) that vitamin B promotes growth in two ways, (1) by stimulating the appetite and consequently increasing food consumption and (2) by exerting a specific influence unrelated to the plane of nutrition, were confirmed by a further series of experiments in which concentrates prepared from rice polishings were used as the source of vitamin B (B_1).

Pitfalls encountered by the novice in vitamin-A assay work, G. E. Ewe (*Amer. Jour. Pharm., 104 (1932), No. 9, pp. 608–612*).—The pitfalls discussed, with practical means of avoiding them, are inadequate breeding diet, too great extremes of temperature in breeding and testing quarters, too liberal endowment of the young with vitamin A, incomplete extraction of casein due to the presence of insensible moisture, variations in the ingredients of the depletion diet, inadequate proportion or poor grade of yeast in the depletion diet, scattering of food, coprophagy, failure to recognize the propitious time to start administration of the vitamin A preparation, incomplete consumption of the vitamin A preparation, and failure to recognize the importance of discarding from the results exceptionally vigorous or exceptionally weak animals.

Pathogenesis of avitaminosis A, L. J. Harris (*Lancet [London], 1932, II,* No. *12, pp. 614–617*).—Following a brief review and discussion of the conflicting evidence as to the anti-infective action of vitamin A, further evidence along two different lines is reported as follows:

Development of lesions of avitaminosis A in rats, L. J. Harris and J. R. M. Innes (pp. 615, 616).—Large groups of rats were kept on a vitamin A-free diet

supplemented after the first signs of deficiency with sufficient vitamin A in the form of red palm oil to prevent rapid development of symptoms of deficiency but not enough to bring about resumption of growth at a satisfactory rate. Several animals were killed for examination every few days between the seventeenth and ninetieth day of the experimental feeding.

In all instances where infection had occurred, keratinization of the neighboring epithelium could be observed. "Thus small abscesses seen in the medulla of the kidney in the later stages appeared to have spread from the pelvis; infectious lesions in the lungs from the bronchi; and those in the tongue from the surface of the mucous membrane."

These findings are thought to point strongly to the probability that the infections are secondary to the structural changes in the epithelium brought about by vitamin A deficiency. This is thought to be substantiated by the well-known fact that the administration of vitamin A to an animal not too far advanced in the avitaminosis will cure the epithelium and restore the animal to normal health.

Influence of vitamin-A deficiency on tubercle infection in rats, L. J. Harris and A. S. Griffith (pp. 616, 617).—Two experiments are reported, "the first of a more general character to test the suggestion that in vitamin A deficiency rats lose their normally high resistance to tuberculous infection and the second to examine more particularly the effects of the increased absorption of the microorganism from the alimentary tract." In both, negative results were obtained. The absence of vitamin A from the diet did not lower the naturally high resistance of rats to tuberculous infection, and no macroscopic tuberculous lesions could be observed in the organs of vitamin A-deficient rats receiving the microorganisms continuously by mouth.

"The existing data afford no basis for the belief that vitamin A therapy is likely to be effective in combating acute general infections due to specific highly pathogenic microorganisms, or in those clinical toxemias and infectious diseases which are unassociated with the peculiar structural breakdown of epithelial tissue and the attendant localized infection which characterizes the vitamin deficiency."

The quantity of vitamin A present in the human liver, L. K. Wolff (*Lancet* [*London*], *1932, II, No. 12, pp. 617–620, figs. 5*).—Data are summarized on the vitamin A content, as determined by the antimony trichloride color test, of 957 specimens of human liver classified according to post-mortem findings in four groups. These groups, with the number of cases and average vitamin A value in blue units, are as follows: Accidents 78 cases and vitamin A value 245 units, acute diseases 267 and 225, chronic diseases 570 and 206, and newborn infants 42 and 70, respectively. Relatively high values observed in diabetes, averaging 484 units for 25 cases, are attributed to vegetable dieting. Based upon a comparison of data from cases killed by accident or dying from acute diseases with those dying from other causes, the belief is expressed that 16 per cent of the population of the Netherlands have definitely subnormal vitamin A reserves.

A footnote states that the values reported should be increased by 10 per cent to be directly comparable with the blue units used by Moore, as noted below.

Vitamin-A reserves of the human liver in health and disease, with special reference to the scope of vitamin A as an anti-infective agent, T. Moore (*Lancet* [*London*], *1932, II, No. 13, pp. 669–674, figs. 2*).—This investigation of the vitamin A content of 325 specimens of human livers obtained on post-mortem examination was undertaken (1) to obtain information as to the

vitamin A reserves of inhabitants of Great Britain similar to that reported by Wolff for the Netherlands, as noted above, and (2) to determine whether low vitamin A reserves can be correlated with any particular type of pathological picture. The report is prefaced by a brief summary of the vitamin A reserves in the rat under varying conditions.

In discussing the data, the medial value in the accident group, 235 blue units per gram, was taken arbitrarily as the normal value. Considering the ratio of the number of cases in any group falling above to those falling below this arbitrary normal value as the normality ratio of the group, the data showed normal ranges of vitamin A in widely different diseases, including various infectious diseases. Reserves much above normal were observed in cases of diabetes which had received dietetic treatment and below normal in organic heart diseases, nontuberculous respiratory diseases (particularly bronchitis), organic kidney diseases, and in septicemias and certain septic conditions. It is pointed out, however, that in some of these diseases vitamin A subnormality may have been a secondary effect rather than a predisposing cause.

"Since adequate vitamin A reserves were frequently observed in a wide variety of infective conditions, it is plain that vitamin A should not be regarded as a positive anti-infective agent, indiscriminate in action. The term 'anti-infective' is only justifiable in a sense complementary to the fact that deficiency of vitamin A leads to subnormal powers of resistance. The trend of the present work suggests that partial vitamin A deficiency, or the state of multiple malnutrition which it must usually imply, may be of importance in the etiology of some types of infection under clinical conditions."

Vitamin-A content of the liver in puerperal sepsis, H. N. Green (*Lancet [London], 1932, II, No. 14, pp. 723–726*).—In this further contribution to knowledge concerning the vitamin A reserves in human liver, data are reported on the vitamin A content of the liver on autopsy in 20 cases of puerperal sepsis treated with large doses of vitamin A (E. S. R., 66, p. 896), 13 cases of puerperal sepsis receiving no vitamin A treatment, and 9 nonseptic puerperal cases. The average values found in the three groups were 261, 122, and 203 blue units, respectively. The low values found in the cases which had received intensive vitamin A treatment are thought to suggest that the liver cells when in toxic or degenerated condition may fail to retain vitamin A.

Vitamin-A reserves in the human liver (*Lancet [London], 1932, II, No. 14, p. 743*).—An editorial discussion of the four papers noted above.

An attempt to produce spinal cord degeneration in dogs fed a high cereal diet deficient in vitamin A. The incidental development of a syndrome of anemia, skin lesions, anorexia, and changes in the concentration of blood lipoids, M. M. Suzman, G. L. Muller, and C. C. Ungley (*Amer. Jour. Physiol., 101 (1932), No. 3, pp. 529–544, figs. 2*).—Observations of the beneficial effects of large amounts of whole liver upon the neurological phenomena of subacute combined degeneration of the cord, as demonstrated by Minot and Murphy (E. S. R., 58, p. 92), and of the production of neurological symptoms indicative of spinal cord involvement in animals on vitamin A-deficient diets usually containing a high proportion of cereals, as shown by various investigators, led to attempts to produce spinal cord degeneration in dogs fed a high cereal diet deficient in vitamin A.

Although these attempts proved unsuccessful as far as the production of spinal cord degeneration in adult dogs was concerned, a syndrome was produced by the diet irrespective of whether or not it contained vitamin A, suggesting a deficiency in one or more of the components of the vitamin B complex other than the antineuritic factor. The syndrome was characterized by ano-

rexia, loss of body weight, dermatitis, skin ulcers, anemia, and changes in the concentration of the lipoids. Each of these symptoms is discussed with reference to possible causation.

Nutrition studies of food stuffs used in the Puerto Rican dietaries.—III, The vitamin G (B_2) content of the ripe plantain (Musa paradisiaca L.) and the pigeon pea (gandul) (Cajan cajan L.), J. H. Axtmayer and S. Silva (*Puerto Rico Jour. Pub. Health and Trop. Med., 8 (1932), No. 1, pp. 1–4, pls. 2*).—This paper continues the series noted previously (E. S. R., 68, p. 271). As determined by the method of Bourquin and Sherman (E. S. R., 66, p. 410), the ripe plantain was found to contain 0.5 and the pigeon pea 2 units of vitamin B (B_2) per gram.

Maze performance of the white rat in relation to unfavorable salt mixture and vitamin B deficiency, M. F. Fritz (*Jour. Compar. Psychol., 13 (1932), No. 3, pp. 365–390, figs. 4*).—This study differs from that of Maurer and Tsai (E. S. R., 62, p. 897) in that the rats did not undergo vitamin depletion until maturity and were tested during the depletion period. The diets were deficient in minerals as well as in vitamin B (complex). The general conclusion drawn from a statistical study of the results obtained was that "relatively mature white rats are able to make daily adjustments to a complicated maze situation with a high degree of accuracy, even though subjected to extremely unfavorable diets."

Incidence of gastric ulcer in albino rats fed diets deficient in vitamin B (B_1), G. Dalldorf and M. Kellogg (*Jour. Expt. Med., 56 (1932), No. 3, pp. 391–398, pls. 3, fig. 1*).—Histological examination of the gastric and duodenal mucosa of 64 rats on the Sherman-Spohn vitamin B (complex) free diet, with and without varying amounts of vitamin B (B_1) and with adequate amounts of vitamin G (B_2), has led to the conclusion that rats deprived of vitamin B (B_1) commonly develop ulcers of the gastric mucosa.

On gross examination of the stomach, gastric dilatation was observed in only a few animals and this bore no relationship to the degree of the deficiency of the diet. No ulcers were visible to the naked eye, but on histological examination severe gastric ulcerations were found in 21 of the 29 animals which had had little or no vitamin B and in 7 of 9 animals which had received vitamin B after a 40-day depletion period. No lesions were found in a group of 6 animals which had received small amounts of vitamin B for periods of from 15 to 54 days and then adequate amounts of vitamin B, or in 20 animals which had had larger amounts of vitamin B throughout the entire time or were on a complete diet.

Of 74 observed lesions, 8 were chronic indurated ulcers resembling chronic peptic ulcer in man. These were in animals which had been on the deficient diet for a long time. The lesions, both chronic and acute, resembled those in man in relative size and in location, being generally situated along the lesser curvature of the stomach.

Yeast and vitamins B_1 and B_2, J. C. Drummond and J. M. Whitmarsh (*Jour. Inst. Brewing, 38 (1932), No. 5, pp. 264–272, figs. 2*).—The early experimental work on the vitamin B (complex) content of yeast which can be interpreted in terms of vitamin B (B_1) is reviewed, and studies are reported on the vitamin B_1 and B_2 content of 4 samples of brewer's and 5 of baker's yeast dried at 40 to 50° C. under reduced pressure and of various yeasts grown in natural and artificial media.

All 4 samples of brewer's yeast were much more valuable sources of both vitamins B_1 and B_2 than the baker's yeasts. Cultures of *Saccharomyces logos*, grown on an artificial medium consisting of purified dextose and salts, were

found to contain both vitamins B_1 and B_2. A typical brewer's yeast (*S. cerevisiae*), previously found incapable of growing in purified sugar-salt media unless supplemented by small amounts of extracts containing bios, showed a decrease in content of vitamin B_1 when grown in such media. The results for vitamin B_2, while suggesting synthesis, were not convincing. The same strain of yeast grown for several generations in a molasses medium became progressively poorer in vitamin B_1 without showing a comparable reduction in vitamin B_2. The authors interpret their observations as indicating that vitamin B_1 of ordinary brewer's and baker's yeast is to a large extent derived by absorption or adsorption from the culture medium, and that some yeasts are capable of synthesizing vitamin B_2.

The plasticity of the calcified tissues.—II, Results of minor variations in the calcium-phosphorus-vitamin "D" complex, W. G. Downs, jr. (*Jour. Dental Res., 12 (1932), No. 2, pp. 363–373, figs. 11*).—To determine the effect upon tooth structure in rats of feeding for short periods of time diets varying slightly in calcium: phosphorus ratio, with and without vitamin D, a series of feeding experiments was conducted for a period of 28 days on rats 28 days old at the beginning of the experiment. A total of 33 diets, devised by L. B. Mendel, was used. These were of three different types, two containing edestin and starch and one corn gluten flour as sources of protein and carbohydrate. The two edestin diets differed in their source of vitamin D, calcium, and phosphorus.

Gross photographs of the jaws after suitable fixation showed no evidence of changes from normal in the teeth and X-ray examinations no regularity of variations in density. Histologically there were slight changes on the various diets. These were evident only when the variations in $Ca : PO_4$ ratio became quite marked. Beginning at about 1 to 0.5 or 0.5 to 1, decalcification occurred, becoming more evident as the upset in balance became greater. For diets having a lower phosphorus content, the histological changes were more noticeable on the addition of vitamin D, while the reverse was true on the low calcium diets.

"The explanation of these effects is not clear. Perhaps, in the case of the lower phosphorus content, addition of vitamin D tends to raise the blood calcium, which, in the tendency to maintain the $Ca\text{-}PO_4$ balance, withdraws additional phosphorus from the depots. Possibly, where vitamin D is added to a low calcium diet, there is a tendency to increase the calcium absorption in the intestine, thus protecting the depots in the bones and teeth."

Effects of ante-natal and post-natal deficiency of vitamin D on animal dentition, S. N. Blackberg and J. D. Berke (*Jour. Dental Res., 12 (1932), No. 2, pp. 349–362, figs. 11*).—In this preliminary report, a detailed description, illustrated by microphotographs, is given of abnormalities in the bones and teeth of a pup born of a bitch which had been on a rachitic diet for two years. Observations are also reported briefly of the gross changes in the jaws and teeth of puppies on a rachitic diet and of gross and microscopic changes in the teeth of young rats on a rachitic diet.

The authors conclude that there is a definite relationship between dietary deficiency of vitamin D and characteristic tooth changes. These are summarized as follows: "Pathological changes in the pulp in the early stages have occurred consistently, the incipient lesion being an intense inflammation accompanying destruction of the odontoblasts. Dentin and enamel changes have been noted in more advanced stages of rickets. There is an increased amount of predentin, and the enamel and dentin are poorly calcified."

Post-eruptive changes in the permanent dentition of dogs fed rachitogenic diets, S. N. Blackberg and J. D. Berke (*Jour. Dental Res., 12 (1932), No. 5, pp. 695–707, figs. 17*).—This paper supplements the one noted above by

describing two abnormalities in four dogs which had subsisted for varying lengths of time after the eruption of permanent teeth on a rachitic ration slightly modified from that of Mellanby (E. S. R., 63, p. 391).

One animal died of unknown cause. In the others, sacrificed after 201, 221, and 495 days on the experimental ration, lesions were found in all the dental tissues. The initial and most severe lesions seemed to be in the pulps, changes in the dentin and enamel occurring only after prolonged deficiency. This is thought to indicate that the process of decay begins in the interior of the tooth itself. Histologically, the lesions in the dentin and enamel were suggestive of those in human caries.

The problem of dental caries (*Nature [London], 129 (1932), No. 3269, pp. 926, 927*).—This is a discussion of recent literature on the subject, with the conclusion that "immunity to caries depends on the teeth being properly calcified and the mouth being immune to the growth of the acid-forming bacillus. Prevention of caries in a susceptible mouth depends on oral hygiene and especially on the regulation of the diet, with the view of increasing the resistance of the teeth. Cereals should be avoided and a plentiful supply of vitamin D (or vitamins A and D) provided, and the diet should contain an abundance of milk, eggs, potatoes, fish, meat, green vegetables, and fruits."

Studies of the cause and nature of dental caries, J. J. Enright, H. E. Friesell, and M. O. Trescher (*Jour. Dental Res., 12 (1932), No. 5, pp. 759–851, figs. 12*).—This extensive report, which should be consulted in the original, attempts to evaluate the so-called nutritional and local environmental schools of thought concerning the cause and nature of dental decay by clinical and laboratory studies covering many years. The general conclusion is that "(1) local environmental conditions are the main factors in the active causation of decay of fully erupted enamel, and that (2) deficient diet and defective nutrition, by being responsible for the construction of teeth more susceptible to the action of the acids of fermentation, are the most important factors during the period of development of the teeth. These studies also indicate that improper diet and defective nutrition, by being responsible for a salivary environment low in content of calcium phosphate, are of some, though minor, importance as a predisposing factor in caries of enamel."

A list of 82 references to the literature and a discussion of the report by various investigators are appended.

Changes in the incisors of rats fed a ration deficient in vitamin A, M. C. Smith and E. M. Lantz (*Jour. Dental Res., 12 (1932), No. 3, pp. 556, 557*).—Attention is called briefly to repeated observations of changes in appearance in the incisors of rats on a diet deficient in vitamin A. Concurrently with cessation of growth and appearance of ophthalmia, the incisors lose their normal orange pigment and become dull white and opaque. There is also a decrease in the hardness of the teeth, particularly in the lower incisors which become shorter and blunt. Cod-liver oil in small doses prevents these changes and also restores normal pigmented translucency in teeth which have been altered by lack of vitamin A. Evidence is presented that the abnormality is due to lack of vitamin A and not vitamin D. Analyses of the incisors of vitamin A-deficient rats at death and of litter mate controls which had received cod-liver oil for 60 days showed a higher percentage of calcium and a lower of phosphorus in the ash of the vitamin A-deficient teeth. This is thought to afford a possible explanation of the softening of the teeth on the deficient diet.

Studies of the metabolism of fluorine.—I, The effect of sodium fluoride in the diet upon the chemical composition of the incisors of albino rats, M. C. Smith and E. M. Lantz (*Jour. Dental Res., 12 (1932), No. 3, pp. 552–554*).—Chemical analyses for calcium and phosphorus of the dry incisors and

their ash of rats subsisting for 60 and 120 days on the Sherman diet B, with and without the addition of 0.05 per cent of sodium fluoride, showed no significant differences in the percentages of calcium or phosphorus (Ca : P ratio) or the percentages of ash in the incisors of the fluoride-fed animals as compared with the controls, although the quantity of fluoride administered was at a level previously found to produce outward changes in the incisors similar to those of mottled enamel in human teeth (E. S. R., 65, p. 596). The changes thus produced are apparently too slight to be revealed by chemical analyses as usually made.

Dental caries experimentally produced in the rat, S. N. Blackberg and J. D. Berke (*Jour. Dental Res., 12 (1932), No. 4, pp. 609–617, figs. 8*).—Litter mate rats 5 weeks of age were divided into three groups, one of which was given the Steenbock-Black rachitic diet 2965 and the other two the same diet supplemented by therapeutic and excessive quantities, respectively, of vitamin D in the form of viosterol. The experiment was continued for 150 days, at the end of which the animals were sacrificed for examination of the first molars.

The control group receiving the basal ration with therapeutic quantities of vitamin D was free from dental caries, while one-third of the rachitic group on the basal diet alone and all of the group receiving excess viosterol developed caries. In most instances the carious lesions were clinically and histologically identical with the occlusal variety of human caries. Microphotographs are given, illustrating the changes in the teeth. Attention is called particularly to extreme engorgement of the blood vessels of the pulp, a condition considered of significance in indicating that circulatory disturbances in the pulp may lead to decalcification of the dentin and enamel.

The production of dental caries in rats fed an adequate diet, C. A. Hoppert, P. A. Webber, and T. L. Canniff (*Jour. Dental Res., 12 (1932), No. 1, pp. 161–173, figs. 7*).—This is a detailed report, illustrated by photographs and microphotographs, of an investigation noted previously from a preliminary report (E. S. R., 66, p. 792). In an addendum reference is made to the criticism by Klein and McCollum (E. S. R., 66, p. 792) of the preliminary report, and further data are given showing a lack of relationship between the phosphorus content of the diet and the incidence of caries in rats.

"These results permit of only one conclusion, and that is that variation in the phosphorus content of the diets in our experiments had no connection with the outcome. It has always appeared rather strange that whereas a deficiency in the diet, be it an inorganic element or a vitamin, caused general metabolic disturbances, the same deficiency should, in the case of caries, affect one tooth and leave the adjacent one untouched. It would be just as reasonable to expect one femur of a rat, on a deficient diet, to have an ash content of 40 per cent, and the other femur to have one of 55 per cent. The localization in the decay of teeth is most reasonably explained on the basis of action by certain factors exterior to the teeth."

Experiments on the dietary control of dental caries in children, E. C. McBeath (*Jour. Dental Res., 12 (1932), No. 5, pp. 723–747, figs. 2*).—This report covers the preliminary phases of an extensive clinical investigation of the problem. Three orphanages near New York City were selected for the study. In each, control groups were maintained on the customary diet of the institution and comparable experimental groups were given such supplements as to insure the protective foods recommended by Boyd, Drain, and Nelson (E. S. R., 62, p. 595). Quantitative data were assembled during the experimental period of from 6 to 7 months on the composition of the daily diets of both groups, with estimates in units of the vitamin intake. In an institution for mentally

defective children a special study was made of the relation of vitamin C to the control of dental caries. In this study a control group received the institution diet alone and four other groups the same diet with the following daily supplements: Three ripe bananas and the juice of three oranges, 8 oz. of orange juice, three bananas, and 6 oz. of tomato juice, respectively. Thorough dental examinations were made at the beginning and end of the experimental period.

In all the control groups in the three orphanages, the increase in caries during the experimental period was more marked than in the experimental groups. The control group in the vitamin C study showed a greater increase in caries than two of the experimental groups, but less than the other two.

In attempting to interpret the data in terms of dietary differences between the experimental and control groups, various hypotheses as to how immunity to dental caries is brought about by diet are summarized essentially as follows: Dietary factors may function (1) by reducing the attacking forces surrounding the teeth, (2) by providing a circulatory condition in the tooth and a lymph in the tooth tissues which neutralize the forces attacking the enamel, (3) by modifying the tooth structure, making it more resistant to attacking forces, and (4) by functioning in all of these ways. The opinions of various investigators concerning the rôles of specific factors with relation to one or another of these hypotheses are discussed, including the views of Bunting et al. (E. S. R., 64, p. 392), Hoppert et al. and Klein and McCollum (E. S. R., 66, p. 792), Mellanby (E. S. R., 63, p. 391), and of various investigators who consider vitamin C to be of particular importance.

The findings in the present investigation are thought neither to confirm nor contradict Bunting's views on carbohydrate intake as a factor, and to give little support to either of the opposing views of Hoppert et al. and Klein and McCollum, or to the view that vitamin C intake is of prime importance. They tend, however, to support Mellanby's view of the importance of vitamin D, since this was the vitamin most deficient in the control diet and most markedly increased in the experimental diet. In general, the results fail to demonstrate the superimportance of any one dietary factor, but confirm the theory of the importance of diet as a factor in the control of dental caries.

The cause of mottled enamel, M. C. Smith, E. Lantz, and H. V. Smith (*Jour. Dental Res., 12 (1932), No. 1, pp. 149–159, figs. 5*).—A condensed report of the investigation noted previously (E. S. R., 65, p. 596).

Factors influencing anemia development in young rats, H. S. Mitchell (*Amer. Jour. Physiol., 101 (1932), No. 3, pp. 503–510*).—Data accumulated in the author's laboratory concerning all of the rats used for anemia studies for two years (E. S. R., 66, p. 490) have been analyzed to determine, if possible, what factors are responsible for the variations noted in the hemoglobin content of the blood of young rats at weaning.

No significant correlation was apparent between the hemoglobin content of the mother's blood at parturition, or between the ages and weights of the young at weaning or the sizes of the litter, and the blood hemoglobin content at weaning. The ration of the mother during pregnancy and the number of litters borne were considered to have slight but significant influence on the hemoglobin values in the young rats. Metal contamination from cages and food cups and coprophagy are thought to interfere seriously with the development of anemia. The blood of female young was found to have a consistently higher hemoglobin content than of the males from the same litter, and consistently longer times were required for the females to develop severe anemia.

The treatment of pernicious anaemia with fish-liver extract, L. S. P. Davidson (*Brit. Med. Jour., No. 3737 (1932), pp. 347–350*).—An extract of fish

liver prepared by methods similar to those of Cohn et al. (E. S. R., 58, p. 92) for mammalian liver was found to have remarkable potency in the treatment of pernicious anemia. Since fish liver can be obtained at only a fraction of the cost of mammalian liver, it is thought that the cost to the patient of fish-liver extract should be much lower than the customary mammalian extract.

Beri beri and neuritis, H. H. Woollard (*Aust. Jour. Expt. Biol. and Med. Sci., 9 (1932), pp. 173–178*).—From observations on two pigs which had been on a completely vitamin B-deficient diet and one on the same diet supplemented by autoclaved yeast, and from previous observations on rats (E. S. R., 58, p. 297), the author concludes that the neurological signs which occur in animals suffering from vitamin B deficiency "are to be regarded as occasional and complicating effects and not an integral part of the picture of experimental beriberi."

Heat-resistant bacteria in fresh and canned vegetables: Botulism poisoning (*Colorado Sta. Rpt. 1932, p. 26*).—In this progress report attention is called to two outbreaks of botulism, in one of which canned cauliflower was involved and in the other smoked ham. A new method of detecting botulinus toxin in canned foods and soil by a serum reaction is announced.

The distribution of iodine in Alberta in relation to the prevalence of goitre.—I, Iodine in the water supplies, O. J. Walker (*Canad. Jour. Res., 7 (1932), No. 2, pp. 137–148, figs. 2*).—In this preliminary study of the iodine content of the water supplies of the Province of Alberta, Canada, the method of McClendon and associates (E. S. R., 62, p. 807) was used, with slight modifications, which are described in detail. In the 118 samples of water analyzed, the iodine content ranged from less than 0.1 to 660 parts per billion of water. The highest content in water from streams was 21, shallow wells and springs 32.8, and deep wells 663 parts per billion.

Information on the prevalence of goiter in the districts where the water samples were taken was obtained from local physicians and veterinarians and from traveling health clinics of the department of health. A tentative goiter map of the Province was compiled, on which was also shown the iodine content of the water in the same sections. A comparison of the prevalence of goiter and the lack of iodine in the water supply revealed a much less close relationship than has been shown in other countries. Various suggestions are given in possible explanation of this, and it is stated that further iodine distribution studies are being undertaken in the hope of throwing more light on the problem.

The prevention of rickets, F. T. Mitchell and S. W. Coley (*Jour. Amer. Med. Assoc., 99 (1932), No. 21, pp. 1768–1772*).—Observations are summarized on the incidence of rickets during the first two years of life in 139 infants in private practice who were given as preventive measures cod-liver oil or viosterol, with in some instances sunlight or ultra-violet irradiation.

The lowest prevalence of rickets, 9.9 per cent, occurred among the infants given sun baths in summer and viosterol or cod-liver oil in winter. In those receiving ultra-violet irradiation in place of sun baths, the incidence of rickets was 13.6 per cent. Of those receiving either cod-liver oil in doses of 2 or 3 teaspoonfuls daily or viosterol in doses of 8 or 10 drops daily, 22.3 per cent showed clinically mild rickets and the Röntgen ray findings were positive in 15.9 per cent. The cod-liver oil in the dosage mentioned afforded complete protection to 82 per cent of the patients, while the viosterol in amounts calculated to furnish more than twice the quantity of vitamin D present in the cod-liver oil afforded protection in only 75 per cent of the cases.

The authors conclude that in the causation of rickets there must be other factors than a deficiency of vitamin D—either a comparative deficiency of vita-

min A, a deficiency of minerals, or "perhaps some other as yet unrecognized agent in which the influence of light possibly plays as important a part as it does in the activation of ergosterol."

The treatment of rachitic infants with milk produced by cows fed irradiated ergosterol, H. J. Gerstenberger and A. J. Horesh (*Jour. Nutrition, 5 (1932), No. 5, pp. 479–483, figs. 3*).—Milk from cows fed irradiated ergosterol, as reported on page 663, was fed to two rachitic infants in amounts of 500 c c daily, together with 500 c c of ordinary skim milk to which were added 5 c c of lactic acid and enough carbohydrate to meet the caloric requirements of the infants. Orange juice was also given in amounts of 15 c c daily.

"The observations made during the treatment period, which for the one infant lasted 10 and for the other 11 weeks, showed conclusively, by the use of weekly Röntgenograms and biweekly blood serum calcium and phosphorus determinations, that the milk possessed antirachitic powers, but that these were not of great magnitude. The bones were not completely healed at the end of the treatment periods, the calcium levels rose to normal only at the tenth week, and the phosphorus level in the one infant at the eleventh week and in the other infant not yet at the tenth week when she was released from the hospital. Further evidence of the mildness of the antirachitic quality of the milk is the fact that the spasmophilic symptoms in one infant did not completely disappear until the eighth week.

"On the basis of practical experience with the feeding of cod-liver oil having a rat protective potency of 5 mg per day, it is estimated that a pint of this particular milk contained slightly less than the equivalent of one-half teaspoonful of such cod-liver oil."

The value of salmon oil in the treatment of infantile rickets, M. M. Eliot, E. M. Nelson, S. P. Souther, and M. K. Cary (*Jour. Amer. Med. Assoc., 99 (1932), No. 13, pp. 1075–1082, figs. 4*).—The salmon oil used in the clinical tests reported included oil prepared commercially from the waste products of humpback or pink salmon, and specially rendered oils from the canned waste products of two other species, the king or Chinook and the sockeye or red salmon. The value of oils of this type as sources of vitamins A and D had previously been determined by Tolle and Nelson (E. S. R., 67, p. 481), and the present clinical studies were supplemented by biological tests of the samples used. These showed that the sockeye and Chinook oils were nearly equal in vitamin A potency to a composite sample of 19 medicinal cod-liver oils, and that the pink oil contained much less vitamin A. The sockeye and pink oils contained twice as much vitamin D as the cod-liver oil composite and the Chinook oil about 50 per cent more.

Clinically the oils were tested on 13 infants with active rickets varying from mild to marked. Six received the pink oil, 1 the sockeye, and 1 the Chinook throughout the test, while in the other 5 the type of oil was changed during the experiment. The oil was given in doses of from 10 to 20 c c a day and was well taken and tolerated.

The response to the treatment was very prompt, and advanced healing was brought about in from 3 to 9 weeks. Although no direct clinical comparison was made with cod-liver oil, it is considered that the "salmon oil used in the present study was probably a more potent antirachitic agent than the average cod-liver oil and compared very favorably in the rapidity of its action with viosterol." It is suggested that owing to the large potential supply of salmon oil available from the salmon canning industries of the Pacific States and Alaska it should be possible to produce it at such a low cost as to be of special value at the present time when the nutrition of infants and children is suffering from lack of proper and adequate food.

HOME MANAGEMENT AND EQUIPMENT

A basis for building a course in economics of the home, F. H. LEIGHTON (*Columbia Univ., Teachers Col. Contrib. Ed., No. 459 (1931), pp. IX+114*).—This study was made "to ascertain, in the light of our changing economic life, what material should be included in a course in the economics of consumption using the problems of everyday family life as the central theme." The data were obtained through interviews with 25 New York City families on each of the following income levels: $900–$1,600, $1,600–$2,300, and $2,300–$3,000. The 126 problems emerging from the interviews are divided into 9 groups and discussed. They are also evaluated by a jury of 75 graduate students and professors of home economics on the basis of the importance of these problems in relation to the particular group of families interviewed when their income possibilities were considered.

Home account keepers find it easier to "carry on" (*Illinois Sta. Rpt. 1932, pp. 239–243, fig. 1*).—In continuation of the investigation noted previously (E. S. R., 66, p. 288), a summary is given of an analysis of the home accounts of 201 Illinois families for the year 1931–32.

MISCELLANEOUS

Sixth International Congress of Tropical and Subtropical Agriculture, 1931, I–III (*6. Congrès International d'Agriculture Tropicale et Subtropicale, Paris, 1931. Comptes-rendus et Rapports. Paris: Sec. Gén. Assoc. Sci. Internatl. Agr. Pays Chauds et Com. Franç., 1932, vols. 1, pp. XCII+637, pls. 9; 2, pp. 448, pls. 2, figs. 4; 3, pp. [1]+313*).—Volume 1 of the proceedings of this congress, held at Paris from July 15 to 19, 1931, deals with its organization and transactions, and includes general papers on tropical agriculture and its development, tropical soils, engineering aspects, plant and animal pests, sanitary regulations governing vegetable products, and the organization of a colonial meteorological service adapted to the needs of agriculture. Volume 2 deals with oil-bearing seeds, rubber, cotton, and other textile crops, medicinal plants, forest products, and food plants and condiments. Volume 3 is devoted to animal production and animal diseases.

Forty-fourth Annual Report [of Arkansas Station], 1932, D. T. GRAY ET AL. (*Arkansas Sta. Bul. 280 (1932), pp. 67, fig. 1*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

The Forty-fifth Annual Report of the Colorado Agricultural Experiment Station for the fiscal year 1931–32, C. P. GILLETTE ET AL. (*Colorado Sta. Rpt. 1932, pp. 64, fig. 1*).—The experimental work not previously refered to is for the most part noted elsewhere in this issue. A biographical note on the late W. P. Headden (E. S. R., 66, p. 497) is included (pp. 35, 36).

A year's progress in solving farm problems of Illinois: [Forty-fifth Annual Report of Illinois Station, 1932], compiled and edited by F. J. KEILHOLZ (*Illinois Sta. Rpt. 1932, pp. 268, figs. 65*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Fifty-first Annual Report of the New York State Agricultural Experiment Station, [1932], U. P. HEDRICK (*New York State Sta. Rpt. 1932, pp. 120*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Solving Oklahoma farm problems: Report of Oklahoma A. and M. College Agricultural Experiment Station, 1930–32, C. P. BLACKWELL ET AL. (*Oklahoma Sta. [Bien.] Rpt. 1931–32, pp. 299, figs. 28*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

NOTES

California University and Station.—Dr. W. F. Holst, since 1927 assistant professor of poultry husbandry and associate poultry husbandman, died January 29. Dr. Holst was born June 17, 1895, in Oslo, Norway. He attended the Royal Technical College at Glasgow, Scotland, and later the Royal Technical College at Karlsruhe, Baden, where he received the degrees of diplom ingenieur and doctor ingenieur. In 1925 he came to Cornell University for special study and later went to California as instructor and junior poultry husbandman. In 1931 he assumed charge of poultry work in the university and station.

Dr. Holst was particularly interested in the relationship of protein levels to growth and reproduction. His most recent work included a study of obscure deficiencies of vitamin nature which become apparent in adult fowls maintained under conditions of commercial egg production.

Harold Compere, research associate in entomology at the Citrus Experiment Station, has returned from a year's absence in the Orient in search for parasites of the California red scale, a major insect pest of citrus in southern California. His exploration covered a large part of India and southeastern China, presumed in the past to be the native habitat of the California red scale. Because of the fact that this scale is practically indistinguishable from other related scale insects occurring in the Orient, the problem of identification has been one of extreme difficulty. Expeditions sent to the Orient by the university on two former occasions have brought back parasites reared from what was thought to be red scale but which when introduced into California proved ineffective. On the recent trip this difficulty was overcome by taking to the Orient plants infested with the California species, but unfortunately the only parasites discovered able to attack the California species successfully were those which already occur in California and are cosmopolitan in their distribution. It is concluded, therefore, that there is no hope of finding in the Orient valuable parasites of the red scale.

Iowa College and Station.—The new genetics research laboratory has been completed at a cost of slightly over $11,000 for the building and its equipment. It is a fireproof structure of brick and hollow tile, a story and a half in height. The ground floor, occupying a space of 32 by 65 ft., contains four small animal rooms, a root cellar, a room for the incubation of chicks, and a utility or workroom. One-third of the upper floor is for seed storage and a laboratory for plant genetics research, and the remainder contains office rooms and three laboratories equipped for general biological work.

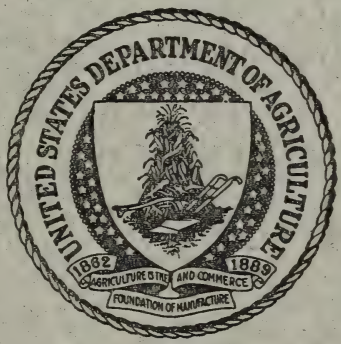
R. S. Stephenson resigned as associate professor of animal husbandry January 1 to engage in farming.

Maryland University and Station.—Richard C. Munkwitz, associate professor of dairy manufacturing and associate in the station, died January 6 at the age of 38 years as a result of ailments incident to his services in Siberia during the World War with the American Expeditionary Forces. He was a native of Wisconsin and received the B. S. degree from the University of Wisconsin in 1922 and the M. S. degree from the University of Illinois in 1923. Following brief periods as assistant in dairy husbandry in Illinois and in extension work in Iowa, he came to Maryland in 1925, and had been engaged chiefly in instruction.

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EXPERIMENT STATION RECORD

Editor: HOWARD LAWTON KNIGHT

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EXPERIMENT STATION RECORD

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EDITORIAL

CHEMICAL RESEARCH IN RELATION TO AGRICULTURE AND HOME ECONOMICS

The recent meeting of the American Chemical Society has directed attention anew to some of the important contributions of chemistry to agriculture and home economics and to the need of continued assistance by the chemists in these fields. The meeting was held in Washington, D. C., from March 27–30, 1933, as the customary spring meeting of the society, and its program for the most part followed the usual lines. It is therefore significant that without special planning so many of the papers presented dealt directly with matters of immediate concern to agriculture and home economics, for it indicates that the basic science of chemistry, traditionally intimately associated with their progress, still finds there some of its most important research opportunities. This sustained interest is very fortunate, for it is well known that the services of chemists must continue to be widely utilized if a solution of some of the urgent problems of the day is to be expected.

Prominent among these current problems is that of spray residues, which received special attention from the society's division of agricultural and food chemistry. This division opened its program with a symposium on insecticides, which included three papers dealing directly with spray residues and several others of a supplementary nature on the effectiveness, limitations, and outlook for commercial production of a number of nonarsenical insecticides, such as rotenone, pyrethrum, various aliphatic thiocyanates, and selenium.

The first paper on spray residues was presented by Mr. R. H. Robinson, of the Oregon Experiment Station, entitled Poisonous Spray Residues on Fruit and Their Removal. It reviewed the long-continued and comprehensive studies of the Oregon Station and the substantial progress which has been achieved in devising practical methods of removing both arsenic and lead from orchard fruits with great effectiveness under a wide range of conditions. A paper entitled Poisonous Spray Residues on Vegetables, by Dr. W. B. White of the Food and Drug Administration of the United States Department of Agriculture, set forth the special difficulties complicating complete spray removal from a number of leafy vegetables, and emphasized the responsibilities of the Food and Drug Administration as regards added toxic materials, such as arsenic, lead, and fluorine nempounds, on foods entering interstate commerce. A final

paper, by Drs. C. N. Myers and B. Throne of the New York Skin and Cancer Hospital, dwelt upon the cumulative nature of the injury caused by both arsenic and lead, and pointed out that the consequent risk of an ultimate chronic poisoning is intensified by the frequent occurrence of small amounts of arsenic as a normal constituent of shellfish and other food products.

Taken as a whole, the symposium was timely, representative, and reassuring. It brought out very clearly that spray residues on marketed products, particularly those entering interstate commerce, have already been reduced to a point where even their cumulative effect is less significant than for many years, and that distinct progress is steadily being made toward still further reductions without serious sacrifice of insect control or undue economic disturbance to growers. At the same time the importance of continued coordinated research by chemists and others was stressed, particularly as regards the broader implications of the problem. As the necessary basis for final achievement, it is not improbable that the development of adequate insecticides nontoxic to man must emerge as the only permanent solution. Such an outcome may not be easy of attainment, but its advantages are so obvious as to justify unusual concentration of efforts in its direction by all agencies concerned.

Another topic which received much attention at the meeting was that of the vitamins. Papers before the division of agricultural and food chemistry dealt with the effect of drying fresh material upon vitamin A, the content of vitamin B (B_1) and G (B_2) in some cottonseed products, the vitamin content of fresh and frozen strawberries and strawberry products, and the canning of tomato juice without the loss of vitamin C. The division of biological chemistry also had a vitamin program, taking up such topics as vitamin A and color in hay and milk, the effect of the curing process upon the carotene and vitamin A content of alfalfa, the utilization of carotene and vitamin A in the presence of mineral oils, the vitamin A, B, C, D, and G content of goat's milk, the stability of vitamin D of cod-liver oil when stored with mixed feeds, observations on the assay of food materials for the vitamin B complex, and crystalline antineuritic vitamin (B_1) obtained with the aid of picrolonic acid.

Closely associated with much of this work was an important series of studies on what may be termed nutritional diseases. There was a symposium on anemia and blood regeneration, in which the relations of iron and copper, vitamin G, cod-liver oil, evaporated milk, and other substances were considered. The iodine content of milk and oysters, readjustments of the salts of milk to increase its value for infant feeding, the influence of cereal diets on rate of growth, reproduction, lactation, and calcification, nitrogen storage in growing children, the influence of storage on the fatty acid content of cod-liver oil, and conditions affecting the extraction of

gossypol from cottonseed meal may be mentioned among the many papers of direct interest to workers in human and animal nutrition.

Further enlightenment on food problems was provided in such papers as the inhibiting action on corrosion of increased acidity in the canning of prunes, the corrosion of metals in the manufacture of evaporated and sweetened condensed milk, the effect of hydrogen-ion concentration on the formation of emulsions for cake batters, and increasing the sucrose content in slices of Irish potatoes by means of glucose. From the home economics viewpoint, studies on the nature of potato starch and tests used in laundry starch specifications were of interest, as were also a paper on the control of temperature and relative humidity in testing the fastness to light of dyed textiles and other discussions of dyeing problems. A number of papers on sugar chemistry, among them The Windrowing Qualities of Co. 281 and Other Varieties of Cane under Louisiana Conditions, were of significance to agronomists and others, as well as to sugar chemists. Fertilizer chemistry was directly represented by papers on the preparation of physiologically neutral fertilizer mixtures and the ammoniation of peat for fertilizers, and papers on the extraction of potash from polyhalite, presented in the division of industrial and engineering chemistry, were also of interest. Nor should mention be overlooked of the relation to agricultural chemistry and engineering problems of a considerable number of miscellaneous papers on such topics as the characteristics of the oleoresins from individual trees of slash and longleaf pine, the utilization of hazelnut oil, alpha cellulose from farm wastes, and the early reactions during the set of Portland cement and the role of calcium sulfate in retardation, to cite only a few of the many of at least contingent appeal.

The program of the Washington meeting brought together a wide variety of papers. In scope and content they doubtless constituted a reasonably representative cross section of current chemical research. It may be worthy of note that a relatively small proportion of those of immediate interest to workers in agriculture and home economics had for their objective the stimulation of production, and that substantially all dealt with problems of recent origin. Many, like spray residues and vitamins, were virtually unheard of even a generation ago.

This situation is typical and illustrates why moratoria on such research, although sometimes advocated, would be impracticable. The problems of the farm and the home change wellnigh daily, and to cope with them speedily and effectively the maintenance of adequate research agencies without serious interruption is essential. From the standpoint of the national welfare, it is fortunate that through the United States Department of Agriculture and the State experiment stations such agencies have been readily available for many years.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

[Chemical investigations of the Michigan Station] (*Michigan Sta. Bien. Rpt. 1931–32, pp. 18, 20, 22*).—The report notes briefly results obtained in the disinfection of water, a method for the determination of fluorine, a comparison of the results for sugar in sugar beets by several methods, and work on adsorption from solutions of electrolytes by ash-free adsorbent charcoal.

The proteins of grasses.—I, Preliminary communication, E. J. Miller and A. C. Chibnall (*Biochem. Jour., 26 (1932), No. 2, pp. 392–402*).—It is noted that various attempts have been made to prepare proteins in good yield from grasses; and that the original ether method of Chibnall (E. S. R., 51, p. 309) was found unsuccessful, though by substituting ether-water for ether good yields of protein have been obtained in some, though not in all, cases.

The protein preparations had a low nitrogen content (12.3 to 14 per cent) and contained varying amounts of nitrogen-free impurities which were difficult to remove. A polysaccharide was found to be present in small amount, but the constitution of the major part of the impurity has not yet been determined. A preparation containing 14 per cent of nitrogen was analyzed by the method of Van Slyke, the amino acid composition being very similar to that of other leaf proteins, save that the presence of cystine could not be demonstrated despite the presence in the protein of 1 per cent of sulfur. Another preparation containing 0.75 per cent of sulfur gave only small amounts of inorganic sulfur, "suggesting the presence in the protein of a nonbasic sulfur-containing amino acid such as methionine."

Studies on crystallized egg albumin, H. O. Calvery (*Jour. Biol. Chem., 94 (1932), No. 3, pp. 613–634*).—Ash, sulfur, and nitrogen having been determined in a highly purified preparation of crystallized egg albumin by the author, figures lower than those generally reported by earlier investigators were obtained, a result which "may be due to a more complete removal of ammonium sulfate." By means of *n*-butyl alcohol extraction, methods similar to those of Vickery and Leavenworth (E. S. R., 60, pp. 413, 414), and other procedures, values for arginine and lysine slightly higher and values for histidine much higher than those generally reported were secured. Tyrosine, tryptophane, and cystine figures agreeing closely with previously recorded results were obtained colorimetrically. The cystine sulfur colorimetrically determined was found equivalent only to about 26 per cent of the sulfur content of the albumin. An attempt to isolate tyrosine quantitatively yielded 3.2 per cent, "a much higher value than any previously reported." Also, "the glutamic and aspartic acids were isolated as hydrochloride and copper salt respectively, before and after butyl alcohol extraction of the hydrolyzate. The values obtained before butyl alcohol extraction are higher than those obtained afterward and agreed quite closely with those of Jones and Moeller [E. S. R., 60, p. 502]." Hydroxyglutamic acid, not previously isolated from egg albumin, was obtained in the proportion of 1.36 per cent.

These and other analytical results are briefly discussed in comparison with those of previous investigations, and the calculation of molecular weights from such data is considered.

Vitellin of hen's egg, H. O. Calvery and A. White (*Jour. Biol. Chem., 94 (1932), No. 3, pp. 635–639*).—Vitellin was prepared by the authors by a method (described in working detail) which yielded material of an ash content (0.32 per cent) much lower than that (more than 3 per cent) of preparations previously reported upon; and the nitrogen distribution according to Van Slyke was determined, together with values, according to colorimetric methods, for tyrosine, cystine, and tryptophane. In addition to the Van Slyke figures, direct isolation determinations of arginine, histidine, and lysine are recorded.

The basic amino acids from neurokeratin: Is neurokeratin a true keratin? R. J. Block (*Jour. Biol. Chem., 94 (1932), No. 3, pp. 647–651*).—The author of this contribution from Yale University and the Connecticut State Experiment Station shows that although the solubility relationships of a preparation conforming closely, both in elementary composition and in the quantities of basic amino acid obtainable from it to the preparations upon which the accepted descriptions of neurokeratin are based, "suggest that it should be classified with the keratins, it shows little or no similarity to the true keratins either in the proportions of basic amino acids yielded . . . or in the molecular ratios of these bases to each other." The true keratins have been shown to yield histidine, lysine, and arginine in such molecular proportions that these amino acids are in the ratios of approximately 1:4:12 (E. S. R., 67, p. 9), while the ratios of the molecular proportions of histidine: lysine: arginine yielded by this specimen of neurokeratin, calculated from the highest values found in these analyses, were 1:2:2. "On the basis of the experimental results reported in this paper, it may be concluded that neurokeratin is not a true keratin."

Isolation of methionine by enzymatic hydrolysis, V. du Vigneaud and C. E. Meyer (*Jour. Biol. Chem., 94 (1932), No. 3, pp. 641–645*).—The authors of this contribution from the University of Illinois showed that methionine may be obtained from casein by hydrolysis with trypsin, the optical rotation of the methionine set free in the enzymatic hydrolysis being practically the same as that of the compounds obtained from the products of acid hydrolysis. The isolation of methionine, from casein hydrolyzed by trypsin, was combined with that of tyrosine and tryptophane, the methionine being found in the filtrate separated after precipitation of the tryptophane with mercuric sulfate in acid solution.

The acidic property of sugars, F. Urban and P. A. Shaffer (*Jour. Biol. Chem., 94 (1932), No. 3, pp. 697–715, figs. 5*).—The relative quantities of NaOH neutralized by glucose (at 25 and at 17°), by fructose (at 25 and at 4°), and by sucrose (at 25°) were determined by means of the hydrogen electrode. All three sugars behaved as dibasic acids. The values obtained for the dissociation constants at 25° were: Glucose, pK_1' 12.09, pK_2' 13.85; fructose, pK_1' 11.68, pK_2' 13.24; sucrose, pK_1' 12.60, pK_2' 13.52. "The data appear to indicate that with each of these sugars a third acidic group begins to function at high alkalinity; but because of large errors in this region the existence of the third group must be regarded as uncertain."

The plant coloring matter, robinin, C. E. Sando (*Jour. Biol. Chem., 94 (1932), No. 3, pp. 675–680*).—The author of this contribution from the U. S. D. A. Bureau of Chemistry and Soils shows that anhydrous robinin, a coloring matter in the flowers of *Robinia pseudoacacia*, possesses the formula $C_{33}H_{40}O_{19}$ and that the air-dried material, after crystallization from water, contains 8 mole-

cules of water of crystallization, ½ molecule of which is lost when the material stands at ordinary room temperature for approximately 10 days. Robinin could be resolved into two mutually convertible modifications, tentatively designated as α- and β-robinin. The α form was obtained by crystallization from water followed by dehydrating, and melted at 195 to 197°. The β form was obtained by crystallizing the α modification from absolute or 95 per cent ethyl alcohol, and melted at 249 to 250°. The β form could be converted to the α form by recrystallizing from water and dehydrating. Optical-crystallographic examinations of the dimorphic forms were made.

The mechanism of the formation of organic acids by mould fungi.—I, The action of Aspergillus niger on sodium hexosediphosphate in the presence of toluene, A. J. Suthers and T. K. Walker (*Biochem. Jour., 26 (1932), No. 2, pp. 317–322*).—The authors showed that sodium hexosediphosphate yields methylglyoxal when subjected to the action of *A. niger* in the presence of toluene. The product was identified in the form of its 2:4-dinitrophenylosazone. It is pointed out that this observation supports the theory "that the early stages of the transformation of glucose into citric acid by mold fungi involve the formation of a hexosephosphate and its conversion into methylglyoxal."

The influence of the medium on the production of bacterial gelatinase, R. B. Haines (*Biochem. Jour., 26 (1932), No. 2, pp. 323–336, figs. 7*).—Gelatinase action was measured by the action of the sterile supernatant liquid, from the centrifugation of a medium in which the organism had been grown, upon the viscosity of a gelatin solution in phosphate buffer mixtures.

In the absence of magnesium and calcium salts, no single amino acid proved much superior to any other, or to ammonium chloride, in ability to promote gelatinase production, except as the growth of the organism was affected. Salts of calcium and of magnesium used together greatly stimulated gelatinase production, however, although magnesium salts alone stimulated growth but partly inhibited the formation of gelatinase. Calcium salts used alone usually stimulated gelatinase formation markedly but showed little or no growth-promoting effect.

The absorption spectrum of hexuronic acid, R. W. Herbert and E. L. Hirst (*Nature [London], 130 (1932), No. 3275, p. 205*).—It is noted briefly that crude and carefully purified hexuronic acid both give a single broad absorption band at about 263 mμ, as reported qualitatively by Bowden and Snow (E. S. R., 67, p. 500). The molecular extinction coefficients and wave lengths of this band, as obtained with 0.002 per cent solution in methyl alcohol, are tabulated. Solutions in this solvent are unstable and show a gradual diminution in the intensity of the band. In water solution a single broad band is shown at 260 mμ which likewise diminishes rapidly in intensity.

The absorption of hexuronic acid, while resembling that of many ketonic substances, differs completely from that of aldose and ketose sugars of the pyranose type which show no absorption bands.

Vitamins from the chemical point of view [trans. title], M. Javillier (*Bul. Soc. Sci. Hyg. Aliment., 20 (1932), No. 7–8, pp. 305–344*).—These two lectures, dealing with recent developments in the chemistry of vitamins A, D, B, and C, were delivered in April and May, 1932.

The structure of vitamin A, I. M. Heilbron, R. A. Morton, and E. T. Webster (*Biochem. Jour., 26 (1932), No. 4, pp. 1194–1196, fig. 1*).—On the basis of the theoretical structure for vitamin A proposed by Karrer, Morf, and Schöpp (E. S. R., 68, p. 151) it occurred to the authors that the new product characterized by narrow absorption bands, as noted by Edisbury et al., might

be formed by intramolecular condensation resulting in a hydronaphthalene. This theory was tested by treating the decomposition products with selenium, which yields true aromatic naphthalene hydrocarbons with many hydronaphthalene compounds.

On treating the product obtained from a rich vitamin A concentrate by the action of alcoholic hydrogen chloride with selenium at from 300 to 330° C., a good yield of 1:6-dimethylnaphthalene was obtained. A similar product was obtained with vitamin A itself by treating 11 g of vitamin A concentrate in 500 c c of alcohol with 6 c c of concentrated hydrochloric acid, allowing the solution to stand for 20 minutes at room temperature, adding solid sodium carbonate to alkalinity, filtering off the excess carbonate, removing the alcohol under reduced pressure, and taking up the residue in light petroleum and washing it repeatedly with water. After removal of the water and the solvent, a light brown viscous oil remained, which on spectroscopic examination exhibited well-defined bands at 392, 369, 350, and 333 mμ. Treatment of this product with selenium gave 1:6-dimethylnaphthalene in 3.5 per cent concentration. This is thought to establish definitely "the terpenoid nature of the vitamin and the presence in the richest concentrates of a material possessing a constitution which, as far as the fourteenth carbon atom, must be identical with the constitution advanced by Karrer, Morf, and Schöpp for vitamin A."

The structure of vitamin A and the synthesis of ionenes, M. T. Bogert (*Science, 76 (1932), No. 1977, pp. 475, 476*).—Attention is called to the paper of Heilbron, Morton, and Webster noted above. In the opinion of the author, the value of these findings in throwing light upon the constitution of vitamin A depends upon the establishment of the constitution of ionene, an intermediate product between the vitamin and 1:6-dimethylnaphthalene. This has been shown in the author's laboratory, both by analysis by V. G. Fourman and synthesis by D. Davidson and P. M. Apfelbaum. Structural formulas are presented in illustration.

Characteristics of highly active vitamin A preparations, I. M. Heilbron, R. N. Heslop, R. A. Morton, E. T. Webster, J. L. Rea, and J. C. Drummond (*Biochem. Jour., 26 (1932), No. 4, pp. 1178–1193, figs. 4*).—In this paper, which should be consulted in the original for the experimental evidence, the authors have embodied the results of work carried on in the two laboratories represented during the previous 18 months in a "final comprehensive attack" on the problem of isolating vitamin A and establishing its constitution. Although their results and those of Karrer, Morf, and Schöpp (E. S. R., 68, p. 151) are considered to point to a definite solution of the problem, the evidence presented is thought to leave the final question still open. "The position which has now definitely been reached is that the richest products obtained both by us and by Karrer and his collaborators, from mammalian and various fish livers, are qualitatively and quantitatively indistinguishable in respect to ultra-violet absorption. If the products are not homogeneous, then either the nonvitamin material is relatively diactinic, or the preparations contain substances so closely alike that both exhibit the 328 mμ band. The absorption spectrum affords no conclusive criterion of homogeneity, although it would be indeed curious if exactly the same proportion of material exhibiting negligible absorption were present in the products derived from various species of fish. On the other hand, the discovery of isomeric α- and β-carotenes, both transformed in vivo into vitamin A-like substances . . . suggests plainly that strict homogeneity must be demonstrated rather than assumed."

In addition the antimony trichloride color test is considered equally indecisive. From the standpoint of analytical data, the failure to prepare crystalline deriv-

atives also raises certain doubts as to the stated purity of the vitamin. It is thought that gross impurities are not involved, but that possibly a small quantity of alcohol probably more saturated than vitamin A has not been eliminated completely.

"Once the remaining doubts concerning homogeneity are resolved, biological, spectroscopic, and colorimetric standards can be set up in terms of which the results of various methods of assay can be expressed."

The use of 7-methylindole in the antimony trichloride colour test for vitamin A, R. A. MORTON (*Biochem. Jour., 26 (1932), No. 4, pp. 1197–1201*).—In the belief that the method suggested by Emmerie et al. (E. S. R., 67, p. 501) for separating the two chromogenic effects produced in the interaction of vitamin A concentrates with antimony trichloride by the suppression of the 617 mμ band with substances of an indole nature might prove more satisfactory than that previously suggested by Heilbron, Gillam, and Morton (E. S. R., 67, p. 341) of varying the concentration of the antimony trichloride, the tests of Emmerie et al. were repeated with a large number of pure substances of the type suggested, including 2-, 3-, and 7-methylindole. Of these, 7-methylindole proved the most successful in inhibiting the 617 mμ band before the band at 583 mμ was affected appreciably. The technic for obtaining the best results with nonsaponifiable fractions of oils is discussed, as is also the bearing of the findings upon the question of the homogeneity of vitamin A concentrates.

The apparent independence of the 617 and 583 mμ bands, as shown by the ease with which one of them can be inhibited, is thought to raise a serious question as to the homogeneity of even the richest concentrates of vitamin A. "Vitamin A may well react in two stages with antimony trichloride, but there is no direct evidence on this point. The ultra-violet absorption spectrum discloses definite information of only one absorbing entity, the color test reveals two chromogenic mechanisms. No decision is yet possible as to whether the richest concentrates are mixtures of extremely closely related substances, or whether one and the same molecule can give rise to the complex color reaction."

Separation of vitamin A, carotene, and xanthophyll [trans. title], P. KARRER and K. SCHÖPP (*Helvetica Chim. Acta, 15 (1932), No. 4, pp. 745, 746*).—Satisfactory methods of separating vitamin A from carotene and other carotinoids are discussed briefly, with reference to a previous report by Wolff et al. (E. S. R., 64, p. 309). If a petroleum ether solution of a mixture of vitamin A and carotene is allowed to trickle through a vertical tube filled with fibrous alumina, which is subsequently washed with more petroleum ether, vitamin A is adsorbed by the alumina and the carotene remains in the petroleum ether. Traces of vitamin A remaining in the solvent are removed by a second adsorption. The vitamin A can be recovered from the alumina by elution with petroleum ether and 10 per cent methyl alcohol. This method is not suitable for separating a mixture of vitamin A with xanthophyll, zeaxanthin, and other acid-rich carotinoids, but if a mixture of these in benzine or benzine-benzol solution is filtered through precipitated calcium carbonate, vitamin A can be recovered from the filtrate and the other materials from the calcium carbonate.

Absorption spectra of substances derived from vitamin A, J. R. EDISBURY, A. E. GILLAM, I. M. HEILBRON, and R. A. MORTON (*Biochem. Jour., 26 (1932), No. 4, pp. 1164–1173, figs. 2*).—To test further the hypothesis that in the antimony trichloride color reaction for vitamin A the fading of the blue color is connected with decomposition of the vitamin molecule (E. S. R., 67, p. 341), the blue solution was poured into a large volume of water to precipitate the antimony as oxychloride, and the organic matter was recovered and studied.

The spectrographic evidence obtained showed that partial decomposition of the vitamin occurred, accompanied always by the appearance of narrow absorption bands with maxima at 399, 376, 357, and 340 mμ (chloroform) and sometimes by additional, less definite maxima at 425, 324, 308, and 280 mμ. The wave lengths at the maxima were constant but varied in intensity roughly with the potency of the material. Similar narrow absorption bands with even more definite maxima were obtained by the action of alcoholic hydrogen chloride on rich concentrates. Similar narrow bands, together with a broad continuous band with a maximum of 290 mμ, were shown in certain fractions obtained by slow high vacuum distillation of rich concentrates heated to about 180° C. By prolonged heating at 120 to 125° in an atmosphere of nitrogen there was rapid decomposition of the vitamin without the development of narrow bands to any extent, but with the development of a main product exhibiting a maximum at 290 mμ. At the boiling point of alcohol the vitamin proved unexpectedly stable to prolonged exposure to a stream of oxygen. Ozonized oxygen on the other hand destroyed the vitamin very rapidly with the disappearance of selective absorption, but with the formation of compounds with maxima at 290 and 272 mμ detectable in the very early stages.

"The data are consistent with the vitamin A molecule containing a side chain with at least four double bonds, which can be attacked in turn by ozone to give products with broad bands."

The isomerisation of carotene by means of antimony trichloride, A. E. Gillam, I. M. Heilbron, R. A. Morton, and J. C. Drummond (*Biochem. Jour., 26 (1932), No. 4, pp. 1174–1177, figs. 2*).—Similar experiments to the one noted above were followed with carotene. When the blue solution formed by mixing antimony trichloride and carotene in chloroform was poured into water, the original color of the carotene reappeared in the chloroform layer from which red crystals were isolated, giving an absorption spectrum quite different from that of carotene both in the visible and ultra-violet regions. The substance was identified with isocarotene, as prepared by the action of either metallic mercury or sodium thiosulfate upon carotene tetraiodide.

Photochemical synthesis of vitamin B_1, B. C. Guha and P. N. Chakravorty (*Nature [London], 130 (1932), No. 3289, p. 741*).—This brief note, based on a cablegram from Calcutta, announces that adenine sulfate has been activated into vitamin B_1 by irradiation with ultra-violet light, but that guanine chloride could not be activated similarly.

Crystalline preparations of vitamin B_1 from baker's yeast, H. W. Kinnersley, J. R. O'Brien, and R. A. Peters (*Jour. Physiol., 76 (1932), No. 1, p. 17P*).—In this preliminary report, the authors state that they have applied the charcoal adsorption methods of Kinnersley and Peters (E. S. R., 63, p. 494) for isolating vitamin B_1, with certain improvements, to 2,000 kg of yeast with a yield of about 30 mg per 50 kg of moist yeast of a crystalline hydrochloride of an activity of from 0.002 to 0.004 mg (2 to 4γ) per day (pigeon dose).

In the method followed the charcoal adsorbate at pH 7 was extracted with dilute hydrochloric acid and the extract precipitated with phosphotungstic acid at an H-ion concentration between pH 5 and 2, the activity at this point being about 0.1 mg. By successive stages of alcohol-phosphotungstate-alcohol, an activity of 0.005 mg (5γ) was obtained in a yield of from 20,000 to 25,000 pigeon doses per 100 kg. The material at this state was in a semicrystalline form. On precipitation by aqueous gold chloride, followed by crystallization from acid alcohol or a mixture of acid alcohol and petroleum ether, needle-shaped crystals were formed, which on recrystallization appeared as clusters of irregular plates. Inasmuch as specimens of Jansen and Donath's crystals of

vitamin B_1 from rice had an activity of from 5 to 8γ, the crystalline product prepared is thought to be a purer source of vitamin B_1. The hydrochloride crystals melted at from 227 to 230° C., with decomposition, and the picrolonate at 165°. Sulfur was present not only in the final crystals but also before the gold stage, a finding of significance in that the method of preparation did not include a treatment with hydrogen sulfide before the gold stage and the sulfur could thus not have been introduced by the hydrogen sulfide.

Crystalline preparations with vitamin B_4 activity, H. BARNES, J. R. O'BRIEN, and V. B. READER (*Jour. Physiol., 76 (1932), No. 1, pp. 8P, 9P*).—In this preliminary report, the preparation of a crystalline hydrochloride of Reader's vitamin B_4 (E. S. R., 65, p. 594) from bakers' yeast is described briefly. After extraction of the yeast and adsorption of the vitamin upon charcoal at pH 1, the method was as follows:

"This charcoal was extracted with 50 per cent acid alcohol, the alcohol removed in vacuo, and the extract subjected to successive treatments with mercuric sulfate, baryta, H_2S, and sodium phosphotungstate. A definite crystalline phosphotungstate, precipitated at pH 2, was obtained and recrystallized from 50 per cent alcohol. It was then dissolved in 50 per cent acetone to remove the phosphotungstic acid with baryta. The filtrate, after removal of acetone, was hydrolyzed by heating on the water bath for 1 hour with 5 per cent HCl; then concentrated in vacuo to quite small volume (5 c c per hundredweight original yeast). On addition of alcohol and ether and standing overnight crystals appeared. Fine needles, with m. p. 248° C. with charring. Preliminary analyses suggest the empirical formula of the anhydrous substance to be $C_4N_4H_5Cl$."

On the surface potentials of unimolecular films of ergosterol.—The photochemical formation of vitamin D, R. J. FOSBINDER (*Roy. Soc. [London], Proc., Ser. A, 139 (1933), No. A 837, pp. 93–104, figs. 8*).—This investigation of the mechanism of the conversion of ergosterol into vitamin D consisted of an examination of the behavior of unimolecular ergosterol films under the influence of ultra-violet radiation, with the conclusion that the photochemical formation of vitamin D involves at least two distinct reactions. The first process, which is reversible, is considered to be a pronounced change in the structure of the secondary alcohol group. Two mechanisms for this reaction are suggested, involving the formation of enolic and ketonic groups, respectively. The former is thought to be more probable in view of the observations of Windaus (E. S. R., 66, p. 7) that ergosterol esters may be activated. "The reaction succeeding this elementary process, and which is irreversible, probably involves a steric or structural rearrangement which is manifested in the adhesion of the CH(OH) group being permanently altered."

Irradiated ergosterol [trans. title], A. WINDAUS and A. LÜTTRINGHAUS (*Deut. Med. Wchnschr., 58 (1932), No. 43, pp. 1669–1672*).—Various questions which have arisen concerning the crystalline preparation of vitamin D named vitamin D_2 by the authors and Calciferol by Askew et al. (E. S. R., 67, p. 201) are discussed, with references to the literature. It is first noted that ergosterol on irradiation yields products in the order of their photochemical activation—lumisterin, tachysterin, vitamin D_2, substance 248 (named for its characteristic absorption band from 248 to 22 mμ), and two so-called suprasterins. Whether the suprasterins are formed directly from vitamin D_2 on overirradiation or through the intermediate step of the substance 248 has not yet been determined. All of these substances can be prepared in crystalline form and are not precipitable by digitonin. Only vitamin D_2 possesses antirachitic properties.

The statement of Reerink and Van Wijk (E. S. R., 67, p. 103) and others that for the production of vitamin D wave lengths above 280 mμ are necessary is considered erroneous, although it is noted that the nature and amount of other photochemical irradiation products will depend upon the wave lengths of the light used. In the authors' opinion the best yield of vitamin D is obtained when ergosterol is irradiated in benzene solution with unfiltered light from a magnesium spark to 50 per cent conversion.

The assertion of Bills and McDonald (E. S. R., 67, p. 503) that the best crystalline preparations of the antirachitic vitamin contain a high percentage of inactive material is considered erroneous, and the evidence upon which belief in the purity of the crystalline material is based is again summarized briefly. Further evidence is given of the remarkable stability of vitamin D in contrast with the crude irrradiation products and of the relative antirachitic activity of the purified and crude products. In discussing the toxicity of crystallized vitamin D and of the crude irradiation products, it is emphasized that although vitamin D itself is toxic in large doses, crude preparations may also contain impurities which are in themselves toxic. The limiting toxic dose for the mouse is given as 0.075 mg of crystalline vitamin D corresponding to 3,000 international units.

The final question discussed is whether or not pure crystalline vitamin D should be used in place of crude irradiation products in the preparation of antirachitically active concentrates. This is answered in the affirmative, the principal reasons given being knowledge without tedious biological tests of the exact activity of the pure substance, its greater stability, and its freedom from toxic overirradiation products without antirachitic activity.

A pH chart, G. H. Bell and A. R. C. Paterson (*Biochem. Jour., 26 (1932), No. 2, pp. 454–457, fig. 1*).—The theoretical foundations of the construction of a nomogram for solving the equation $pH = \frac{V-v}{0.00019832\ T}$ are presented; and the figure itself, with a range of from about pH 1.5 to 8.5 for temperatures of 19, 21, and 23° C., and for temperatures of 20 and 22° from about pH 8.5 to 12, is shown. The manner of placing the data from the glass and from the quinhydrone electrodes in a form to be converted into pH values by means of the same nomogram is also indicated.

A method for determining combined water and organic matter in soils, G. Bouyoucos (*Soil Sci., 34 (1932), No. 4, pp. 259–267, pl. 1*).—Apparatus for the determination of combined water is described in this contribution from the Michigan Experiment Station. This apparatus consists essentially of a distillation bomb made from iron pipe, closed at one end and provided at the other with a thread fitting an iron cap carrying a brazed-in short piece of ½-in. pipe to which is brazed a 2-ft. length of ⅛-in. copper tubing cooled by a short condenser of lead pipe through which the copper tubing is soldered; together with a narrow cylinder graduated to 0.1 c c in which the water to be measured is collected over a layer of carbon tetrachloride. The bomb illustrated has a capacity of 250 c c, and samples of 100 g are used. Distillation is effected in an electric muffle furnace at 800° C. in the case of mineral soils, and at 330° in that of peats or mucks. The distillation was found to be completed in about 15 minutes. Accuracy trials showed a recovery of from 9.9 to 10 c c out of 10 c c of water added to previously ignited samples of various soil types.

Of the determination of organic matter it is noted that "because the combined water can be determined, the ignition method now becomes more accurate and reliable for determining the organic matter in soils."

Estimation of plant available phosphate in soil, P. L. HIBBARD (*Soil Sci., 35 (1933), No. 1, pp. 17–28*).—Finding that a 1:4 water extract has approximately the same phosphate ion concentration as has the actual soil solution, the author of this contribution from the University of California obtains "a fair idea of the concentration of PO_4 in the soil solution immediately available to the plant" by applying the molybdenum blue colorimetric method to the water extract "prepared by shaking 50 g of soil with 200 c c of ordinary distilled water in a closely stoppered bottle for an hour in an end-over-end shaker." It is noted that the shaking should be very gentle, since a violent shaking markedly alters the amount of the PO_4 ion dissolved from sandy soils.

This procedure, however, "does not indicate the total easily available water-soluble PO_4 in the soil. For this purpose, a 1:100 water extract is made. This gives a solution about as dilute as is convenient for estimation of PO_4 by the molybdenum blue method, otherwise a still greater dilution would be preferable for soil having much easily soluble PO_4. The 1:100 water extract does not give the actual total water-soluble PO_4, but it does provide a figure which, for the purpose of comparison, is equivalent to the total or serves as well."

Since, in the case of the 1:100 extraction, there is not enough soil on the filter to permit filtering clear by using a Büchner funnel in the usual way, use was made of a receiver consisting of two bulbs and so constructed as to permit collecting the filtrate in one of them until clear, then in the other without interruption of the suction holding down the paper in the funnel. The turbid first runnings could be returned to the filter, also without interruption of the suction, by means of this receiver. It is noted that, to gain some idea of the "continued supplying power of the soil," similar second and third extracts may be examined.

By means of a percolation method and apparatus which are described, the author finds it possible "to measure the amount of easily soluble phosphate in the soil, the time rate at which it will be supplied by the soil, the level at which it will be supplied after the first easily soluble portion has been removed, and the pH of the solutions which indicate the buffer power of the soil, and give some idea of the amount of easily soluble calcium in the soil. The calcium thus dissolved seems to control somewhat the solubility of the phosphate."

For the determination of the total easily soluble phosphate content of the soil, the author prefers 0.5 N sulfuric acid to other dilute acid extractants. The Truog method (E. S. R., 64, p. 312) was also given trial in comparison with the other procedures noted.

A general schedule for the estimation of that part of the phosphate content of the soil which will be available to plants is thus outlined: "Test for carbonate by adding HCl, and determine pH by a suitable indicator, cresol red or phenolphthalein. If the soil effervesces or has a pH over 8, it is to be considered as alkaline an must be tested for PO_4 by other special methods. If the soil is not alkaline, make the Truog test. If the PO_4 is very high or very low, no other test is needed to characterize the soil. If the Truog test indicates a medium amount of PO_4, other tests are needed. Make water extracts 1/1 or 1/4 and 1/100. If the concentration of PO_4 in both is above 0.2 p.p.m. and above 500 in the Truog test no other test is needed, but if the Truog test is 300 or less it may be well to make the test by percolation with water and with 0.05 N H_2SO_4."

The interpretation of the results of the determinations indicated is discussed in some detail.

Water analysis for sanitary and technical purposes, H. B. Stocks, rev. by W. G. Carey (*London: Charles Griffin & Co., 1932, 2. ed., rev. and enl., pp. VIII+135, figs. 4*).—In the present revision of the original edition (E. S. R., 30, p. 12) a section on simple bacteriological methods has been included. Definite determination of the presence of *Bacillus coli* by preliminary and confirmatory tests is regarded as sufficient evidence of pollution, so that tests for streptococci and for *B. enteritidis sporogenes* are omitted.

The amino-acids of tissues.—VI, Determination of the basic amino-acids in small quantities of protein, J. L. Rosedale and G. A. da Silva (*Biochem. Jour., 26 (1932), No. 2, pp. 369–376*).—This work, of which the present report appears to be in continuation of a series (of slightly different title) previously noted (E. S. R., 65, p. 310), describes a micro method for the estimation of the basic amino acids. Histidine was determined by precipitation with mercuric sulfate from the products of the hydrolysis of 0.3 g of protein with a 20 per cent solution of sodium hydroxide, with which the sample was boiled for from 18 to 20 hours. The histidine content of the mercuric precipitate was estimated in the micro form of the Van Slyke apparatus. The remaining basic amino acids were determined in the products of the hydrolysis of a like sample with 25 per cent hydrochloric acid, with which the sample was boiled for 36 hours. The resulting solution was concentrated 5 or 6 times under diminished pressure to remove as much as possible of the hydrochloric acid, and a modified form of the Van Slyke method was then applied.

Microchemical laboratory manual, F. Emich, trans. by F. Schneider (*New York: John Wiley & Sons; London: Chapman & Hall, 1932, pp. XVI+180, figs. 88*).—Following a brief introduction which outlines the scope of the technic under consideration, the manual considers (1) apparatus and methods, and (2) practice exercises. A third section by F. Feigl deals with spot analysis. Brief notes of two previous German editions have been made (E. S. R., 56, p. 201).

Photometric chemical analysis, I, II, J. H. Yoe (*New York: John Wiley & Sons; London: Chapman & Hall, 1928, vol. 1, pp. XX+771, figs. 72; 1929, vol. 2, pp. XVI+337, pl. 1, figs. 44*).—Volume 1, on colorimetry, consists of part 1—general principles, apparatus, calculations, calibration and correction curves, errors, colloids, and directions for using a precision colorimeter; part 2—inorganic; part 3—organic; part 4—biological; part 5—bibliography; and part 6—tables of logarithms, an author index, and a subject index. Volume 2 contains a similarly arranged treatment of nephelometry.

Handbook of the analysis of plant material, I–III, edited by G. Klein (*Handbuch der Pflanzenanalyse. Wien: Julius Springer, 1931, vol. 1, pp. XII+627, figs. 323; 1932, vols. 2, pp. XI+973, figs. 164; 3, pts. 1, pp. XIII+806, figs. 44; 2, pp. VI+807–1613, figs. 23*).—Volume 1 deals with general chemical and physical methods and the treatment and proximate analysis of plant material. Inorganic substances are dealt with in volume 2, and organic substances in volumes 2 and 3. An appendix on the analysis of lignin appears in volume 3, part 2.

Food analysis: Typical methods and the interpretation of results, A. G. Woodman (*New York and London: McGraw-Hill Book Co., 1931, 3. ed., pp. XII+557, figs. 110*).—Practically no change has been made from the plan of the second edition (E. S. R., 52, p. 113); but "some of the methods have been changed to conform to the advances initiated by the referees of the Association of Official Agricultural Chemists and detailed in the journal of the association."

The colorimetric determination of phosphorus, E. J. King (*Biochem. Jour., 26 (1932), No. 2, pp. 292–297*).—The author proposes, in the digestion of

the sample, to replace sulfuric acid by perchloric acid, "which is a much better oxidizing agent for the destruction of the organic material in total phosphorus determinations." Further, he develops the color at a high acidity, "which allows of considerable variation without any loss in the proportionality of color produced," so that no allowance need be made for the presence, in moderate proportions, of trichloracetic acid in test solutions. He confirms the observations of Fiske and Subbarow (E. S. R., 55, p. 310) with reference to the suitability of 1:2:4-aminonaphtholsulfonic acid for use as reducing agent. The reductant named developed the blue color fully in five minutes.

A colorimetric method for the determination of allantoin, H. W. Larson (*Jour. Biol. Chem., 94 (1932), No. 3, pp. 727–738*).—In outline statement, "5 c c of animal urine are treated with an excess of 30 per cent phosphotungstic acid, followed by an excess of saturated basic lead acetate solution and 5 per cent sulfuric acid. This treatment removes interfering substances. The procedure is carried out in the same 50-c c centrifuge tube. After the addition of each reagent the tube is gently rotated to insure proper mixing, and the mixture is centrifuged until perfectly clear. Two c c of this liquid are pipetted into a Folin-Wu sugar tube together with 2 c c of Folin ammoniacal copper reagent, which is reduced by allantoin. This is then heated in a boiling water bath for 10 minutes, cooled, and 2 c c of acid molybdate reagent added. The color obtained is read against a 1-mg allantoin standard."

Recoveries of allantoin added to rat urine ranged from 90 to 100 per cent; values obtained colorimetrically checked with those obtained by use of the mercury-allantoin reagent on the same solution; and two hours only were required for the complete determination, "as against the 10 or 12 hours required by the Wiechowski-Handovsky method now in general use." The preparation of the reagents required is described in full working detail.

The determination of pyruvic acid and the preparation of lithium pyruvate, W. B. Wendel (*Jour. Biol. Chem., 94 (1932), No. 3, pp. 717–725*).—Report is made upon the effect of the redistillation of pyruvic acid on its alkali titer, its iodine consumption in alkaline solution, and its reduction to lactate. The preparation of a lithium salt of pyruvic acid (lithium pyruvate monohydrate) which serves as a suitable substance for quantitative test of methods for pyruvic acid determination is described, together with the conditions for "the rapid and apparently complete" reduction (in the cold) of pyruvic acid to lactic acid by the Zn-Cu couple in sulfuric acid solution and for a subsequent determination of the latter by the Friedemann-Cotonio-Shaffer method (E. S. R., 58, p. 114).

An iodimetric method for the determination of iron in blood, J. H. Blackwood and J. D. Stirling (*Biochem. Jour., 26 (1932), No. 2, pp. 353–356*).—A 2-c c sample is "drained under the surface of 2 c c of distilled water," and evaporated with 5 c c of concentrated nitric acid to a volume of 2 c c to oxidize the greater part of the organic matter. Sulfuric acid, nitric acid, and perhydrol are used in the completion of the digestion, after which 1 c c of distilled water is twice added and evaporated, to remove nitric acid and perhydrol completely. The cooled solution is treated with 5 c c of concentrated hydrochloric acid, 3 c c of distilled water, and 2 c c of a 4 per cent solution of potassium iodide. The iodine liberated by the ferric iron is then titrated with 0.005 N thiosulfate, a few drops of a 1 per cent solution of starch in saturated sodium chloride solution being used as indicator. A blank is to be determined for each new set of reagents. Satisfactory recoveries of iron from a solution of a pure iron salt and of known quantities of an iron compound added to a blood sample of known iron content are recorded.

A method for determining calcium in urine, H. Gerritz and J. C. Knott (*Washington Col. Sta. Bul. 275 (1932), pp. 28, 29*).—A modification of the standard volumetric oxalate method is briefly described.

Experimental work on cucumber fermentation, F. W. Fabian, C. S. Bryan, and J. L. Etchells (*Michigan Sta. Tech. Bul. 126 (1932), pp. 60, figs. 8*).—The five sections of this bulletin deal respectively with the influence of sodium chloride on the biochemical and bacterial activities in cucumber fermentation; the influence of acids, bases, and salts on cucumber fermentation; the influence of some enviromental factors; morphological studies on spoiled cucumber pickles; and studies on cucumber pickle blackening.

The work with sodium chloride indicated that peptonizing organisms, at first more abundant than acid-producing bacteria, are gradually killed off by the brine, more rapidly in a brine of 40° salometer than in a 30° brine. Among a number of other observations recorded is the fact that "sugar increased the number of acid-producing bacteria in the brine after a period of three months"; and it is noted that "the addition of sugar to brine is highly desirable."

It was concluded, in part, that lime or sodium bicarbonate, by neutralizing the acidity produced by the acid-forming bacteria, creates a condition favorable for proteolytic bacteria, should never be added to fermenting cucumbers, and should be reduced to a minimum by every possible means. Very hard water is undesirable, and only high quality salt should be used. Acetic acid, to control cucumber fermentation, was found unnecessary, but a small amount was apparently beneficial in 30° salometer brine. Acetic acid added to high-test brines, such as 40° salometer, seemed detrimental, since it apparently delayed fermentation. "A high acetic acid content in the presence of a high salt concentration is an undesirable combination."

It is considered that 50 parts per million of chlorine available from sodium hypochlorite is apparently too much for the most successful fermentation, though smaller quantities added more frequently might prove helpful in controlling the fermentation. Salt is emphasized as the most important factor in controlling the process.

The acidity of a barrel kept outdoors was nearly twice as high as that of a barrel kept indoors, the acidity disappearing much more rapidly from the barrel kept indoors. Barrels outdoors had a more gradual fermentation with a higher acid production, and the acid persisted much longer. It was found necessary to be more careful about the salt concentration in the case of outdoor tanks than it is with indoor tanks. The top layer of cucumbers from an unweighted barrel showed signs of spoiling within 24 hours, as evidenced by soft spots on the surface—a possible explanation of layers or areas of soft pickles in a vat of pickles otherwise prime.

In the spoilage studies, in normal pickles, except for a decided plasmolysis caused by the high sodium chloride concentration, the cells appeared intact and normal; but in the early stages of decomposition "slippery pickles" showed morphological evidences of such decomposition. "The pectic material in the lamella of the epidermal and parenchymatous cells was no longer evident. In pickles having soft spots, the decomposition started at the periphery and extended toward the center. Usually, only the first few layers of cells were involved. The first evidence of softening in pickles entirely submerged in brine usually appeared at the blossom end and extended toward the stem end.

"Pickles in the advanced stage of decomposition ('mushy pickles') showed marked morphological evidences of such decomposition. Practically all the cell walls of the epidermal and parenchymatous cells were gone. The vascular bundles and seeds appeared to be little affected and are the last part of the cucumber to be decomposed."

Blackening was found due to the presence of small quantities of iron compounds together with the formation of hydrogen sulfide in the brine. It occurred only in nearly neutral or alkaline brines, was found to begin at the top of the brine, to be accompanied by an odor of hydrogen sulfide with or without the odor of other putrefaction products, and to be retarded, though not prevented, by a 1-in. layer of mineral oil on the surface of the brine.

Softening appeared not to be related to brine blackening except in that both required a neutral or alkaline brine for development. Combined softening and blackening were accompanied by a strong ammoniacal odor.

"The addition of a sugar, as dextrose or sucrose, to the brine after the active fermentation has ceased seems to be beneficial when pickles are to be stored for any length of time. There is a sufficient number of acid-producing bacteria left to cause a considerable increase in the acidity."

AGRICULTURAL METEOROLOGY

What the atmosphere does to solar radiation, C. F. Brooks (*Bul. Amer. Met. Soc., 13 (1932), No. 12, pp. 217–220*).—Reviewing briefly work of various investigators on the subject, the author concludes that "in cloudy weather, reflection and scattering turn back an average of 58 per cent or more of the original sunshine. In clear weather, scattering to space is 9 per cent. The average of reflection and scattering together in all weathers is 35 per cent, according to Milankovitch. Absorption of solar radiation by the atmosphere varies little with the weather, averaging around 20 per cent. Thus even in clear weather the atmosphere prevents about 30 per cent of the original solar radiation from reaching the surface of the earth, while on the average (including cloudy and partly cloudy days) 55 per cent is prevented from reaching the earth's surface."

Fifty years of North American rainfall, O. L. Fassig (*Bul. Amer. Met. Soc., 13 (1932), No. 11, pp. 205, 206*).—From a study of available rainfall records, 1881–1930, it appears that "for the entire area of North America, as well as the area of the United States, the records show a marked period of excessive rainfall during the decade 1881–1890 and two marked periods of deficient rainfall from 1891–1900 and for 1920–1930." "There is little positive evidence of regular recurring periods, or of steady increases or decreases over the entire period of 50 years for the continent as a whole, or for individual States or regional areas."

Monthly Weather Review, [September–October, 1932] (*U. S. Mo. Weather Rev., 60 (1932), Nos. 9, pp. 177–192, pls. 10; 10, pp. 193–206, pls. 6*).—These numbers contain the usual detailed summaries of climatological data, solar and aerological observations, observations on weather on the Atlantic and Pacific Oceans and on rivers and floods, and bibliographical and other information. In addition, No. 9 includes articles under the heading of West Indian Hurricanes of August and September, 1932, by R. H. Weightman, C. L. Mitchell, and F. E. Hartwell (pp. 177–179); and No. 10, notes on Bishop's Ring Seen in Australia Following the Explosion of Quizapú, Chile, April 10, 1932 (p. 193); Weather Charts of the Northern Hemisphere (p. 193); and Tropical Disturbance of October 7 to 15, 1932, by R. H. Weightman (p. 193).

Climatological data for the United States by sections, [September–October, 1932] (*U. S. Dept. Agr., Weather Bur. Climat. Data, 19 (1932), Nos. 9, pp. [201], pls. 2, figs. 4; 10, pp. [200], pls. 3, figs. 4*).—These numbers contain the usual brief summaries and detailed tabular statements of climatological data for each State.

Meteorological observations, [September–December, 1932], C. I. Gunness and H. Jenkins (*Massachusetts Sta. Met. Ser. Buls. 525–528 (1932), pp. 4 each*).—These are the usual summaries of observations at Amherst, Mass., with brief notes on the more significant features of the weather of each month.

The December number contains an annual summary for 1932, which shows that the mean pressure for the year was 30 in.; the mean temperature 48.2° F., as compared with the normal of 47.2°, highest 92° September 2, lowest —11° December 17; total precipitation 39.42 in., as compared with the normal of 43.49 in., snowfall 45.25 in., as compared with the normal of 48.38 in.; mean cloudiness 57.3 per cent, bright sunshine 53.7 per cent; last frost in spring June 8, first in fall September 11; last snow April 27, first November 26.

Meteorological report for 1931, F. E. Hepner (*Wyoming Sta. Rpt. 1932, pp. 46–48*).—The usual summaries are given of observations on pressure, temperature, precipitation, wind, frost-free period, and sunshine at the University of Wyoming, Laramie, with brief notes on the weather of the year.

Agricultural climatography of Bohemia [trans. title], W. Bienert (*Deut. Landw. Rundschau, 9 (1932), No. 11, p. 664*).—Brief reference is made in this review to a more detailed account of an attempt to show the relation between the geographical, geological, climatic, and phenological conditions in different regions of Bohemia and their adaptation to such crops as grain, potatoes, sugar beets, vegetables, pastures, forage plants, and forest products.

Phenological observations in vineyards [trans. title], F. Zweigelt (*Acta Phaenol., 1 (1932), No. 4, pp. 106–123; Fr. Eng. abs., p. 123*).—Attention is called to the fact that phenological observations in vineyards in Germany and Austria show inconsistencies which are not always in accord with the climatological and meteorological conditions. These discrepancies are ascribed to the character of the individual plants, and it is pointed out that to obtain reliable data "all the plants need to be offsprings of one individual and to belong to the same clon."

SOILS—FERTILIZERS

Soils: Their origin, constitution, and classification, G. W. Robinson (*London: Thomas Murby & Co.; New York: D. Van Nostrand Co., 1932, pp. XV+390, pl. 1, figs. 12*).—"The first section of the book is occupied with the origin, constitution, and properties of soils, and, since the standpoint adopted is the exhibition of soils in their natural relationships," it deals "mainly with those topics which appear necessary for this purpose. The next section is devoted to the description, with illustrative examples, of the chief soil groups of the world. This is followed by a discussion of the problem of classification, and an account, given with due reserve, of the geographical distribution of soils." The remainder of the book deals with soil surveys and soil analysis and is concluded with a brief discussion of the interrelationships of soils, plant growth, and agriculture.

The chapter headings are: Introductory; general view of the constitution of the soil; the pedogenic processes; the clay complex; base exchange and other reactions of the colloidal complex; soil organic matter; general physical properties of soils; water relationships of soils; soils of the podsolic group; tshernosems and their related groups; ground-water soils, including peats; saline, alkaline, and soloti soils; soils of the humid Tropics and sub-Tropics; soils associated with calcareous parent materials; the classification of soils; the geography of soils; soil surveys; soil analysis; and soils, plant growth, and agriculture. An appendix deals with methods of analysis; and an index of places and an index of subjects are included.

[Soil investigations of the Arizona Station], W. T. McGeorge (*Arizona Sta. Rpt. 1932, pp. 56, 57, 61, 62*).—Results of soil work not previously reported upon are briefly noted under the captions, mechanism of ion absorption by plants as well as a study of the availability of plant nutrients in arid soils, study of the soil-plant system with reference to the availability of water principally at or near the wilting point, together with a study of the absorption, passage, and exchange of gas in soils, and a lysimeter study of the nitrogen balance in irrigated arid soils.

[Soil and fertilizer investigations of the Michigan Station] (*Michigan Sta. Bien. Rpt. 1931–32, pp. 53, 54, 55*).—Items included in the report take up the fertilization of Upper Peninsula soils, and muck soil management, including the application of copper sulfate.

[Soil investigations of the Montana Station] (*Montana Sta. Rpt. 1931, pp. 16–21, 38–40, 42, figs. 5*).—Soil work for which results are reported includes data from the reconnoissance soil survey and a detailed soil survey of irrigated areas, studies of the phosphorus needs of Montana soils, and tests of the Winogradsky or soil plaque method.

[Soil and fertilizer studies in South Carolina], H. P. Cooper et al. (*South Carolina Sta. Rpt. 1932, pp. 23–36, 44–46, 53–55, figs. 12*).—Data are reported as to the difference in response of soils to additions of calcium arsenate, relations of soluble phosphate fertilizer and soil characteristics to arsenic toxicity, management of soil affected by additions of calcium arsenate, comparison of sodium nitrates from various sources, experiments with potash fertilizers as to time of application, symptoms of potassium, manganese, and magnesium deficiency in crops, soil acidity and the use of limestone for cotton and Austrian peas, machine placement of fertilizers for cotton, effect of manganese and copper on the growth of crops, further observations on manganese deficiency in soils at Florence, and a study of the influence of fertilizers on the calcium, phosphorus, and protein content of rye, oats, clover, and vetch.

[Work of the Washington Station on soils and soil fertility], S. C. Vandecaveye, L. C. Wheeting, H. M. Wanser, H. D. Jacquot, H. P. Singleton, W. A. Rockie, and P. C. McGrew (*Washington Col. Sta. Bul. 275 (1932), pp. 15–17, 53–55, 57, 71, 72*).—The report presents concise statements of the results of work on the maintenance of organic matter in eastern Washington soils, fertility investigations of Washington soils, tillage and soil moisture, permanent fertility and organic matter maintenance, fertilizer tests for alfalfa, covering outcropping clay points with black soil, fertilizer plats on clay hilltops, fertilizer applications for stubble decay, and effects of fertilizer upon soil conditions and upon yields.

[Soils and fertilizers, West Virginia Station notes] (*West Virginia Sta. Bul. 254 (1932), pp. 3–5, 19, 20, 21, 23, 24*).—These consist mainly of brief items under the following heads: Improved methods of soil maintenance, liming pays, acid soils may contain sufficient soluble aluminum to be harmful, excessive liming may be temporarily injurious to crops, some nitrogen available in acid soils, concrete soil bins used to study fertilizer response, corn sap may be used to determine available phosphate in soil, and availability of the tricalcium phosphate formed as a result of the method of adding the nitrogen to mixed fertilizers known as ammoniation.

A proposed descriptive symbolism for soil horizons, D. W. Pittman (*Jour. Amer. Soc. Agron., 24 (1932), No. 11, pp. 931–933*).—Noting the inadequacy of the A, B, C method of designating soil horizons (in that "there is no longer universal agreement as to the meaning or application of the symbols A, B, C, and D as applied to soil horizons"), and pointing out some

objections to the substitute systems thus far proposed, the author of this contribution from the Utah Experiment Station proposes to assign arbitrarily to a series of letters descriptive significance with respect to "differences in color and accumulations or residues which can be readily detected in the horizon," using the consonants in alphabetical order; and to the vowels with respect to structural differences. This codal descriptive system is designed for use as a supplement to the A, B, C system, with the addition of a specification of the depth in centimeters of each layer and a further indication of the well-marked characteristic by printing its descriptive letter in boldfaced type, and the same characteristic, when less conspicuously developed, by the use of ordinary type. Letters difficult to transliterate into Russian are avoided.

Some important soil profiles of southern Puerto Rico, J. THORP (*Soil Sci., 34 (1932), No. 4, pp. 241–257, pls. 2, figs. 4*).—The soils discussed in this paper were found in south central Puerto Rico, the average annual temperature being 78° and the annual precipitation from 25 to 60 in. "As a result of the high annual evaporation the mature soils of the region belong to the chernozem and chestnut-colored soil groups. The normal profiles for these soils are not developed but take the form of chernozem 'clay pans' and chestnut-colored clay pans." Where the alluvial fans of the coastal plain approach the marshy lands and lagoons bordering the Caribbean Sea, alkali and soluble salts were found to have accumulated in many of the soils to such an extent as to interfere with their agricultural development, these "alkali spots" supporting a typical halophytic vegetation.

All soils of the area, except peat and muck, so far as observed, showed pH values well over 7, many of them exceeding 8. "Worms and insects have accomplished much in the translocation of soils materials from one horizon to another in all of the soils except those which are very salty or very wet. In the latter the land crabs are very active in transferring material from the subsoil to the surface."

A list of the principal halophytic plants is given, together with the types of salty lands to which each is adapted.

Soil survey of the Salachi area, Suiyuan Province, China, R. L. PENDLETON, L. C. CH'ANG, W. CHEN, and K. C. HOU (*China Geol. Survey, Soil Bul. 4 (1932), pp. [3]+42+[32], pls. 9*).—Detailed descriptions of Suiyuan silt loam, very fine sandy loam, and clay loam, developed on the plains; of Salachi fine sandy loam, sandy loam, gravelly sandy loam, loam, and silt loam, formed on the sloping alluvial fans; and of the minor group of Taotzuhao organic soils, are given.

"The soils are all very immature, showing for the most part a high content of calcium carbonate. The clay that is present has not been developed in the area by weathering, but for the most part been carried into the area by the Huang Ho. . . . Analyses of a large number of soil samples for their water-soluble salt content show this to be sufficiently high to constitute a clear warning of the dangers involved in any extensive irrigation of the soils, and an indication of the certain trouble that may follow unless the most careful methods of irrigation are observed.

"The climate is very arid, and cold, with an average rainfall of about 388 mm, though this varies very greatly from year to year. Most of the rain falls between June and September. For about 150 days the temperature rises above 15° C."

Soil survey for irrigation purposes in South Africa (*Imp. Bur. Soil Sci. [Harpenden], Tech. Commun. 15 (1930), pp. [1]+9+[2]*).—Under the head,

objects of the irrigation soil survey, the paper notes the following as questions especially to be considered in a survey having the practicability of irrigation specifically in view: Does the soil contain a large amount of soluble salts? At what depths do these salts occur, and are they likely to rise to the surface? Is sodium carbonate present in dangerous amounts? Is sodium clay likely to result on irrigation? Is the underdrainage such that excess of salts will be removed, and, if so, is adjacent land likely to be harmfully affected? Is the physical make-up or depth of the soil such that normal irrigation is possible, or is water-logging likely to result? What is the nature of the irrigation water and what is its duty likely to be? What systems of applying water, cropping, or working the soil are most advisable?

Other topics taken up are the constitution of soil survey parties, method of work, field observations, the field laboratory, surveying and drafting, type samples, control of field work, and utilization of data. An example of the field notes sheet and of a progress report form are appended.

Soil erosion (*Imp. Bur. Soil Sci. [Harpenden], Tech. Commun. 5 (1929), pp. [2]+14+8*).—Following an introduction which stresses the importance of the problem and indicates the widespread interest taken by various governments, the paper contains a section descriptive of various quantitative experiments, including some of those carried out in the United States; a section on preventive measures; a section on terracing and drainage; a list of the references cited in the paper; and a bibliography which "contains all the references on soil erosion filed at the bureau."

Soil erosion: Supplementary note (*Imp. Bur. Soil Sci. [Harpenden], Tech. Commun. 16 (1931), pp. [1]+10*).—This is supplementary to Technical Communication 5, above noted, its object being "to bring the information up to date and to complete the bibliography." The present paper takes up experiments in Nyasaland, Uganda, United States terracing, Missouri and Tennessee, Texas, and California, and on physical and chemical properties related to erosion. A supplementary bibliography is included.

The influence of moisture upon the rapidity of decomposition of lowmoor peat, S. A. Waksman and E. R. Purvis (*Soil Sci., 34 (1932), No. 5, pp. 323–336, figs. 5*).—Using the quantity of the volatile products as an index of the rate of decomposition, the authors of this contribution from the New Jersey Experiment Stations found about 15 per cent of the total dry matter of lowmoor peat to be decomposed, at the optimum moisture content of from 50 to 80 per cent of the total weight of the moist peat, in 18 months. Above or below the optimum moisture content range the decomposition rate fell off rapidly; and it is noted that "by controlling the amount of water in the peat, one can almost at will control the speed of peat decomposition." Drying the peat and then remoistening it greatly stimulated its decomposition. Except that the nonnitrogenous complexes decomposed somewhat more rapidly than the nitrogenous, the peat used decomposed as a whole, no one chemical complex disappearing more rapidly than others. The material soluble in dilute alkali solutions increased as a result of the decomposition.

"In the process of decomposition of a lowmoor peat, there was a parallel liberation of carbon as CO_2 and of nitrogen as ammonia, with an average ratio of C/N liberated as 20:1. This is somewhat wider than the C/N ratio of the peat itself, which is about 18:1, and tends to explain the increasing nitrogen content of the peat as a result of decomposition."

The influence of temperature on the nitrate content of soil in the presence of decomposing cellulose, J. E. Fuller and L. H. Jones (*Soil Sci., 34 (1932), No. 5, pp. 337–351, pl. 1, figs. 4*).—The authors of this contribution

from the Massachusetts Experiment Station maintained, at temperatures ranging from 10 to 35° C., soils of low organic nitrogen content and soils of high content of that constituent, with and without the addition of celulose, for a period of seven weeks. A series of fallow soils was paralleled by a series of soils from the same sources, identically treated and containing tomato plants. Certain of the soils of these two series were treated with calcium carbonate or with calcium sulfate.

In soil of low organic nitrogen content the addition of cellulose resulted in a depletion of nitrate at all temperatures. Calcium carbonate added to this soil in the presence of added cellulose reduced the nitrate depletion during the latter half of the time period at 20° and above. Calcium sulfate was not an effective substitute. In soil rich in organic nitrogen, added cellulose resulted in nitrate depletion at all temperatures during the first half of the time period. During the latter half of the time period, at temperatures of 25° and above, the nitrate content of the soil containing added cellulose approached equality with the nitrate content of the same soil without added cellulose. The addition of calcium carbonate to this soil and with and without added cellulose stimulated nitrification.

The dry weight of the plants was considerably reduced by the addition of cellulose to a soil low in nitrogen. In a soil of high organic nitrogen content the addition of cellulose reduced the nitrate content, but not below that of the requirements of the crop. Calcium carbonate stimulated the growth of the plants at the higher temperatures both in the presence and the absence of added cellulose. Calcium sulfate appeared to lower the yield of dry plant material.

Causes of low nitrification capacity of certain soils, G. S. Fraps and A. J. Sterges (*Soil Sci., 34 (1932), No. 5, pp. 353–363, figs. 2*).—A large number of samples of soils did not nitrify ammonium sulfate when examined at the Texas Experiment Station, though they usually produced some nitrates from the soil nitrogen. Such soils did nitrify ammonium sulfate after the addition of cultures of actively nitrifying soil, of calcium carbonate, or of both nitrifying culture and calcium carbonate. It is further stated that approximately one-half of the 7 surface soils which did not nitrify ammonium sulfate could be made to nitrify effectively by adding calcium carbonate, and the other half by adding both calcium carbonate and soil cultures containing actively nitrifying bacteria. "Of the 19 subsoils which did not nitrify ammonium sulfate, 2 assumed a high nitrifying power by additions of bacteria alone, 1 by addition of carbonate, and 16 by addition of both calcium carbonate and bacteria in a nitrifying culture."

Sterilized soil cultures of low calcium carbonate content caused no nitrification. Inoculating liquids produced little nitrification and are not considered a satisfactory means of adding nitrifying organisms to a soil. The amount of nitrate production increased in general with the quantity of the inoculant culture within the range 0.1 to 20 g added to 200 g of sterilized soil, but "not in direct proportion to the number of bacteria added," and the authors did not find it possible to measure the number of bacteria added directly by the quantity of nitrates produced.

Nitrites were sometimes produced from ammonium sulfate when nitrates were not. Nitrites were in some cases produced from ammonium sulfate after the addition of calcium carbonate with but little concomitant production of nitrates.

"The quantity of nitrites from ammonium sulfate in a sterilized soil was found to be highest when 0.1 g of inoculant was used to 200 g of sterilized

soil, and decreased with the amount of inoculant, until, with 2 g of inoculant, practically no nitrite remained. Nitrite organisms are either more abundant in the soil than nitrate organisms or else they multiply more rapidly. The total production of nitrites, as measured by the sum of the nitrous and nitric nitrogen, is not in direct proportion to the numbers of organisms added. The first addition of 0.1 g of culture to 200 g of soil produces a high quantity of nitrites plus nitrates, whereas subsequent increments produce much smaller quantities."

The microflora of the ash of Katmai volcano with especial reference to nitrogen fixing bacteria, N. R. Smith and R. F. Griggs (*Soil Sci., 34 (1932), No. 5, pp. 365–373*).—Samples of bare volcanic ash collected by the authors of this contribution from the U. S. D. A. Bureau of Chemistry and Soils 18 years after the eruption of Mount Katmai were shown to contain no fungi or actinomycetes. The number of bacteria was found to be about 150,000 per gram. None of the organisms commonly known to be able to fix nitrogen were present. Samples of ash on which a layer of various species of liverworts (Jungermanniaceae) were growing were plated out with the result that fungi were shown usually to be present in small numbers, and that no actinomycetes were found; whereas the numbers of bacteria found in the surface layer varied from 65,000 to 300,000, 1 in. below the surface layer, 900,000, and 6 in. below 1,400,000.

Bacillus radiobacter was readily isolated from Ashby agar plates made from the liverwort layer. It was also found underneath the liverwort but to a less degree. Pure cultures of *B. radiobacter* grown in a soil extract mannite solution also failed to fix appreciable amounts of nitrogen. No culture of Azotobacter was obtained, nor was there any development of Azotobacter slime in Ashby's solution.

Nitrogen-fixing experiments in which Ashby's solution was used and inoculated with the ash or liverwort layer failed to show any fixation, whereas a fresh soil and a sample sealed like the ash samples gave both a fair fixation and the typical Azotobacter pellicle.

It is concluded that if fixation of nitrogen occurs in volcanic ash, it can not be attributed to the microflora.

Nitrogen fixers of leached alkali soils, J. E. and J. D. Greaves (*Soil Sci., 34 (1932), No. 5, pp. 375–383, pl. 1*).—The authors of this contribution from the Utah Experiment Station obtained 11 microorganisms from leached alkali soils for study in pure cultures, finding all of them to possess the power of fixing nitrogen when cultured in soil with an optimum content of moisture and appropriate carbohydrates. The quantity of nitrogen fixed varied with the specific microorganisms and the carbohydrate added to the soil. Sucrose, arabinose, inulin, starch, lactose, galactose, mannite, sodium lactate, xylose, maltose, and dextrose were all used by some of the organisms, the efficiency varying in an order the inverse of that in which they are named. Xylose, maltose, and dextrose were found poor sources of energy.

Some of the organisms fixed as much as 1.4 mg of nitrogen in 10 g of soil, a figure comparing favorably with fixations made by Azotobacter. The possibility that a part of the increase in nitrogen came from pyrrole compounds or from combined nitrogen in the air was considered. Neither source was found to be the cause of the gains.

The soils from which these microorganisms were obtained, when kept in pots under greenhouse conditions with optimum moisture content, were found to gain appreciable quantities of nitrogen, most of which is believed to have come from atmospheric sources. It is further believed that the organisms described play a major rôle in the observed phenomenon.

[Reclamation of alkali land] (*Wyoming Sta. Rpt. 1932, p. 37*).—The report very briefly notes the successful application of the method of from 40 to 60 days' submergence under dike-retained water in the fall to remove alkali.

The laws of soil colloidal behavior.—X, Exchange neutrality and combining capacity, S. Mattson and J. B. Hester (*Soil Sci., 34 (1932), No. 6, pp. 459–483, pl. 1, figs. 10*).—The ninth paper of this series from the New Jersey Experiment Stations has been noted (E. S. R., 68, p. 592). The present contribution deals with the amphoteric nature of soils and their combining capacity as expressed in the form of neutralization curves obtained by treating the electrodialyzed soil with a neutral salt solution to which free acid is added on the one side and free base on the other. The pH developed in the neutral salt solution was found to represent very nearly the pH of exchange neutrality, "that is, the point at which the soil combines with an equal number of anions and cations of the salt," this point being related to the strength of the acid and basic residues of the soil complex. The ultimate pH is defined as the pH of the completely unsaturated soil ampholytoid, which also was found to be strictly an intensity factor.

"The combining capacity for anions and cations depends upon the quantity of the acid and basic residues sufficiently active to become engaged at the pH in question. Evidence of podsolization, which involves an alteration of the amphoteric complex of hydrolysis, may be found by applying the method to the soil profile. The colloid content and the saturation value may also be directly found from this type of curve."

On the determination of the ion exchange capacity of soils, J. S. Csiky (*Soil Sci., 34 (1932), No. 4, pp. 269–279, figs. 2*).—The quantity of the ions exchanged in soils treated with increasing quantities of a replacing reagent were found almost independent of the specific soil properties, the principal influence being that of the quantity of the exchangeable ion present, i. e., "by its degree of dissociation only."

Further, "the cation adsorption of soils, if increasing amounts of a replacing reagent (calcium acetate solution) are used, gives, therefore, curves which are hyperboloid and can be characterized . . . by their asymptote formulas"; so that various important values could be calculated from two or more experimentally determined points on the curve. "The comparison of values calculated on this basis, with independent determinations of the amounts of metallic cation necessary for the displacement of H ions until equal pH values are reached, shows that the equivalent weights of the different complexes with respect to their exchangeable H ions are proportional to the calculated ratios of soil to reagent necessary to effect the same amount of cation exchange."

It is admitted, however, that "it seems to be probable that the comparability of the adsorption curves suffered to some small extent because of an influence of the physical properties of the different materials and because of other ionic reactions. A further experimental study along this line is necessary to show whether or not quantitative determinations of exchangeable ions and comparative determinations on ionization of colloidal ionogens can be made on this basis."

Report of the government chemist for the year 1931, B. W. Whitfeild (*Wellcome Trop. Res. Labs., Chem. Sect. Pub. 65 (1931), pp. 28*).—The Khartoum laboratory investigated the exchange capacity of some Gezira clays. The Gezira laboratory studied the movement of soil salts under irrigation, showing that, although "the depth at which subsoil salts are encountered varies an inch or two from season to season," such changes appeared "largely due to swelling or mechanical disturbances of the upper layer when wetted or cultivated or, conversely, to shrinking during drying out." It also determined

soil levels on certain plats, with results confirming the conclusion just noted with respect to movement of salts and adding the conclusion that "there is in addition a small downward movement of salts through the soil . . . at the rate of about one in. in three years." It made moisture determinations on the soils of cotton plats, and it investigated soil improvers (gypsum, calcium chloride, ferrous sulfate, etc.), the residual effect of gypsum, the sulfate content of soils, the effect of irrigation on Gezira soil, soil nitrogen, and the evaporation of irrigation water.

Some correlations between crop yields and the readily available phosphorus in soils as determined by Truog's method, F. L. Davis and G. D. Scarseth (*Jour. Amer. Soc. Agron., 24 (1932), No. 11, pp. 909–920, figs. 4*).—Readily available phosphorus as determined by the Truog method (E. S. R., 64, p. 312) and by means of a procedure slightly altered from that of Truog was compared with greenhouse crop yields on a number of Alabama soils subjected to various fertilizer treatments; and statistical and graphical analysis of the relationship of readily available phosphorus to crop yield was made. The relationship in question appeared best represented, the values used being assumed to have a representative distribution, by a power curve of the equation $Y=a+bX+cX^2----$.

It is also stated that "when the relationship between field and greenhouse yields has been established and when sufficient data are considered, the statistical correlation and graphical analysis of the relationship between the values for readily available phosphorus of soils and the greenhouse yield of crops on these soils can be used as a basis for (a) estimating the need for phosphate fertilization of other soils from their content of readily available phosphorus; (b) for predicting the relative yields of crops when grown without phosphate fertilization on other soils, from their content of readily available phosphorus; and (c) for predicting the approximate percentage in crop yields on soils in response to phosphate fertilization from their content of readily available phosphorus." Further conclusions are drawn from the data indicated.

Effect of exchangeable base and soil treatments on phosphorus solubility, A. T. Perkins, H. H. King, and E. J. Benne (*Soil Sci., 34 (1932), No. 5, pp. 385–392*).—In separate portions of a Cherokee loam the absorbed bases were replaced by the authors of this contribution from the Kansas Experiment Station with hydrogen, iron, aluminum, calcium, magnesium, potassium, and ammonium, respectively; and these preparations, together with an untreated portion of the same soil, were treated with monocalcium phosphate, calcium carbonate, calcium chloride, and potassium chloride, each in various quantities, to determine the effect on the water-soluble phosphate content.

The water-soluble phosphate content was increased by the replacement of the bases with potassium or ammonium. Calcium carbonate increased the soluble phosphate of the soils saturated with iron, aluminum, or magnesium, but decreased it in those saturated with hydrogen, calcium, ammonium, or potassium. Lime increased the phosphate solubility in the soils containing absorbed iron or aluminum ions but decreased it in the soils containing absorbed hydrogen ions. Calcium chloride did not effect any increase in phosphate solubility, and potassium chloride was without effect regardless of the base contained in the soil.

When phosphorus was applied as monocalcium phosphate the iron and aluminum soils precipitated large quantities of phosphorus; the hydrogen, magnesium, and calcium soils, intermediate quantities; and the potassium and ammonium soils, small quantities. "In acid soils with similar pH values, less phosphorus will be precipitated on the application of phosphatic fertilizers when the acidity is caused by absorbed hydrogen rather than by the hydrolysis."

Preliminary studies in the use of nitrate of soda on certain Indiana soils, F. Moser (*Soil Sci., 34 (1932), No. 6, pp. 445–457*).—In two successive seasons of early cool weather, causing a general nitrate deficiency, sodium nitrate produced, according to the results recorded in the present contribution from the Indiana Experiment Station, distinct increases in yield; but "the average crop increases produced by the nitrate . . . applications on corn, during the two years, were barely sufficient to pay the cost of the nitrate. The 50-lb. application in July was the only application to give a net profit." In general, the small amounts of nitrate applied in the row at planting time on corn at first stimulated but later caused the crop to suffer from lack of available nitrogen. The average of the two years' data on applying the nitrate to wheat showed the smaller rates of application, 50 or 100 lbs., the most profitable, the April applications proving best. Top-dressing timothy meadows with sodium nitrate in moderate amounts was beneficial in increasing yields, in stimulating growth, and in limiting the growth of weeds. The percentage of protein was raised more by late than by early application as well as by a heavier application of sodium nitrate.

Some transformations of urea and their resultant effects on the soil, H. W. Jones (*Soil Sci., 34 (1932), No. 4, pp. 281–299, figs. 13*).—Observations of the effects of soil moisture, of time, of temperature, and of the concentration of urea in the soil on the conversion of urea nitrogen to ammonia and nitrates were made in the cases of 1- and 2-g portions of urea in 5-kg portions of Norfolk sand, acidity relationships also being noted both in the leached and unleached soil.

The rate of ammonia accumulation from urea appeared to decrease with increase in the soil moisture in the early period of incubation. When nitrification began the quantity of ammonia accumulated from urea decreased with an increase in soil moisture up to 13.95 per cent of the dry soil. At 15.85 and 17.95 per cent moisture the ammonia accumulation again increased. At 20.55 per cent moisture, which gave an anaerobic condition of the soil (saturation with water), very little ammonia accumulated from urea.

The ammonia formed from urea was converted to nitrate nitrogen very slowly in comparison with the rate of conversion of urea to ammonia. There was no significant production of nitrate nitrogen at 21° C. until 17 days after urea was added to the soil. The optimum soil moisture for nitrate production in Norfolk sand at 21° was found to be 13.95 per cent. No nitrates were formed in the culture containing 20.55 per cent moisture. Doubling the concentration of urea in the soil produced a slightly higher concentration of nitrate nitrogen, but the percentage of urea nitrogen converted to nitrate was less at the higher concentration of urea.

Over the average daily temperature range, 10° to 30°, the production of nitrates from urea appeared to vary directly with the temperature. At 21° the rate of production was slow at first but increased gradually throughout the experiment.

Leaching the soluble salts produced from urea in the soil increased the pH value of the soil-water suspension. The extent of the change in pH value effected by leaching was found to depend on the concentration of ammonia and nitrate nitrogen in the soil.

Soluble aluminum studies.—II, Minimum concentrations of aluminum found to be toxic to corn, sorghum, and barley in culture solutions, W. S. Ligon and W. H. Pierre (*Soil Sci., 34 (1932), No. 4, pp. 307–321, pls. 2*).—In continuation of work already noted (E. S. R., 68, p. 161), corn, sorghum, and barley plants were alternated daily at the West Virginia Experiment Station between complete nutrient solutions and similar solutions containing aluminum

but no phosphate. It was found that aluminum in concentrations as low as 1 part per million was definitely injurious to the growth of all three plants studied. Increasing the concentration of aluminum above 1 part per million progressively increased the injury to plant growth. In the presence of 1 part per million of aluminum, barley was the most seriously injured. At higher concentrations of aluminum, however, sorghum was injured more than barley; corn considerably less injured than either barley or sorghum. The aluminum injury was first noted in the roots. It became more evident in both roots and tops with increasing age of the plants.

An increase in the H-ion concentration of the nutrient solution from pH 6 to 4.5 was most injurious to the growth of corn, less to that of sorghum, and least injurious to the growth of barley. Further, as has been indicated by the work of McLean and Gilbert (E. S. R., 58, p. 121) on the less ready absorption by aluminum injured plants of dyes, nitrates, and water, "it is reasonable to suppose that a poor root system would be less able to absorb the necessary nutrients than in nutrient solutions, and consequently greater injury to the plant would result."

On the use of silicic acid as a fertilizer, A. Weihe (*Ein Beitrag zur Kieselsäuredüngung. Inaug. Diss., Univ. Kiel, 1931, pp. 47*).—This is a doctorate thesis dealing with pot and field experiments on the value as a fertilizer of the waste silicic acid produced in the manufacture of superphosphate.

The silica was applied both in an ignited and in a nonignited condition, the ignition having the purpose of driving off the acid firmly retained by the silica following the phosphate acidifying process. It was also found possible to remove the acid by treatment with calcium carbonate. In both pot and field experiments the favorable effect of the ignited silica was clearly evident. It is considered that in addition to a probably direct effect, the finely divided silica, by reason of its very large aggregate surface, brings into play absorption phenomena by which the moisture-holding capacity of light and medium heavy soils is increased and a better nutrition of the silicic acid treated plants thus secured.

Commercial fertilizers, 1932, J. M. Bartlett et al. (*Maine Sta. Off. Insp. 145 (1932), pp. 65–96*).—Results of analyses of fertilizers collected in the 1932 inspection are reported and discussed.

Inspection of commercial fertilizers for the season of 1932, H. D. Haskins (*Massachusetts Sta. Control Ser. Bul. 65 (1932), pp. 50*).—The annual fertilizer analyses are presented. It is noted that over 90 per cent of the total tonnage conformed closely to the "New England Standard Nine" grades.

AGRICULTURAL BOTANY

Molds, yeasts, and Actinomycetes, A. T. Henrici (*New York: John Wiley & Sons; London: Chapman & Hall, 1930, pp. X+296, figs. 100*).—This is a handbook for students of bacteriology, designed to "fill the gap existing between the brief and inadequate discussions of the fungi found in current textbooks of bacteriology and the extensive monographs and technical articles which treat of particular groups." It includes "sufficient information about fungi in general, and about those forms of importance to the bacteriologist in particular, so that the student will be prepared to use the more technical literature . . . such descriptions and keys that will enable him with confidence to identify some of the commoner or more important species, and at least approximately place the others within their proper family and genus; and . . . references

to general works or specific monographs where detailed information on particular forms may be found. . . . The literature cited includes, for the most part, only works of a general character or specific monographs in which extensive bibliographies may be found, save that more recent contributions not found in such works have been included."

Plant physiological investigations [at the Michigan Station] (*Michigan Sta. Bien. Rpt. 1931–32, pp. 19, 20*).—Notes are given of findings as to the accumulation of starch in the leaves of peas grown in solutions deficient in potassium and on the effect on lettuce and soybeans of irradiation with different degrees of intensity of ultra-violet light.

Analytic studies in plant respiration, I–III (*Roy. Soc. [London], Proc., Ser. B., 103 (1928), No. B 726, pp. 412–445, figs. 7; 446–490, figs. 24; 491–523, figs. 5*).—Three studies are presented as noted below.

I. *The respiration of a population of senescent ripening apples*, F. F. Blackman and P. Parija.—This paper gives data on the respiratory phenomena presented by 21 apples slowly ripening in storage at a temperature about 2.5° C. during eight months. The general metabolic phenomenon is a steady drift through what is termed (to distinguish it from the phases of adolescence and maturity) the senescent phase. This consists of a fundamental change in the organization of the tissues, described as a lowering of the normal organization resistance, so that hydrolysis of reserve and of semireserve substances proceeds at a rate faster than that in the mature phase. It also gives a greater output of carbon dioxide, due to a greater production of the effective substrate for respiration.

The primary quantitative features presented by the respiration of each apple are the initial value, which measures its physiological state when removed from the store, and the form of the subsequent course of respiration hour after hour when continued at 22°. The variety of magnitudes and forms exhibited, on careful collation, evidence a systematic drift. It appears evident finally that there are two or possibly three classes of apples present, ripening at different rates. But the authors were able to detect a succession in each class.

The observed respiration of an apple in senescence is an integration of two independent, opposed processes. One of these, the starvation drift at 22°, tends continually to lower respiration. The other, tending to accelerate respiration, is the lowering of organization resistance, expressed in this connection as rise of hydrolysis facility. This work is regarded as not yet complete confirmation of the hypothesis used.

II. *The respiration of apples in nitrogen and its relation to respiration in air*, P. Parija.—The first paper of this series dealt with the complex phenomena presented by respiration while in a current of ordinary air. The same individual apples were studied in nitrogen and in oxygen of different concentrations. In the present paper the respiratory data obtained in nitrogen are examined.

"All these considerations lead us to take up the definite position that the difference between the air condition and the nitrogen condition is something other than the difference between carbon dioxide produced by oxidation of sugar and carbon dioxide produced by splitting of sugar. The simple ratio relations which might govern a situation determined wholly by oxidation are not found to be applicable. We conclude that a consideration of the carbohydrate metabolism which is antecedent to respiration and supplies the substrate for this catabolic complex must be brought into our field of inquiry."

III. *Formulation of a catalytic system for the respiration of apples and its relation to oxygen*, F. F. Blackman.—This paper is considered as in effect an extension in more realistic form of the analytic study begun in the second paper of this series, which dealt with the respiration of apples in nitrogen. This advance is conditioned upon bringing into the survey the whole drift of the metabolites involved in respiration and picturing this drift as a system of catalyzed reactions.

"In the first section of this paper we set out dogmatically a proposed schema of respiration reactions; in the second section we sketched our view of the functional working of this chain of reactions in relation to starvation and to variation of oxygen supply; in later sections we turned to the actual records, and demonstrated that the system provides a plausible interpretation of all the quantitative variations of carbon dioxide production that we had observed in these apples.

"Now that we have worked through all these particular aspects of the matter, we may conclude by surveying more generally the essential features of the new situation. The most fundamental departure is that attention is concentrated upon the rate of glycolysis, as much when the tissue is in air as when in nitrogen. Glycolysis is regarded as the common measure of respiration in all conditions. The production of carbon dioxide provides us with an index of the magnitude of glycolysis.

"Another feature is the adoption of the view that normal hexoses . . . are not the direct substrate for glycolysis or oxidation, but that some specialized derivative of them is indicated for this function."

Temperature characteristics for the production of CO_2 by germinating seeds of Lupinus albus and Zea mays, P. S. Tang (*Jour. Gen. Physiol.. 15 (1931), No. 1, pp. 87–95, figs. 4*).—When the production rate of carbon dioxide by germinating seeds of *L. albus* and *Z. mays* was studied within the temperature range of from 12.5 to 25° C. by the use of the HCl–$Ba(OH)_2$ titration method, the temperature characteristics obtained differed from those previously obtained for the oxygen consumption of the same seeds germinated in the same way. For *L. albus*, the temperature characteristics above and below the critical temperature of 20° are 16,100± and 24,000± calories, respectively. For *Z. mays* no evidence of a critical temperature was found in this range, and the temperature characteristic is 20,750± calories throughout the range of temperature tested. The possible interpretations of the difference in the values of temperature characteristics for oxygen consumption and for production of carbon dioxide are noted.

Polarity in Casuarina paludosa, T. T. Colquhoun (*Roy. Soc. Aust. Trans. and Proc., 53 (1929), pp. 353–358, figs. 4*).—In a study of the question whether the admitted polarity in plants is stable or labile, and as to whether it is inherited, induced, or impressed, portions of the bark of *C. paludosa* were taken off the stem, reversed, regrafted, and allowed to grow. After growth had taken place from the bark experiments were carried out with the shoots, and finally sections of the graft were examined.

It was found that buds of *C. paludosa* when grafted upside down grow without any apparent check or effect. No cuttings have to date given rise to roots when grown in water culture. Longitudinal sections of the wood transverse to the line of graft showed twisting of the fibers and vessels.

An apparatus for determining the absorption of carbon dioxide by leaves under natural conditions, A. J. Heinicke and M. B. Hoffman (*Science, 77 (1933), No. 1985, pp. 55–58, fig. 1*).—An equipment found highly efficient is described and discussed.

GENETICS

Proceedings of the Sixth International Congress of Genetics, Ithaca, New York, 1932, Vol. II (*Brooklyn: Brooklyn Bot. Gard., 1932, vol. 2, pp. XVI+405*).—Abstracts are given of the following papers presented at this congress (E. S. R., 67, p. 497): Polyploidy in Sphaerocarpos, by C. E. Allen (pp. 1, 2); Character Recombination as a Genetic Tool, by E. Anderson (p. 2); Pine and Walnut Breeding for Timber Production, by L. Austin (pp. 2–4); Chromosomes and Phylogeny in Crepis, by E. B. Babcock (pp. 4, 5); A Study of the Inheritance of Anatomical Defects Occurring in the Descendants of X-rayed Mice, by H. J. Bagg (p. 5); The Inheritance of Rate of Growth in Daphnia, by A. M. Banta and T. R. Wood (pp. 5, 6); Studies on the Mechanism of Crossing Over in Drosophila—II, Experiments with Certain Translocations, by G. W. Beadle and S. Emerson (p. 7); The Importance of the Ancestral Table and the Table of Descendants for the Methodical Investigation of Heredity in Mankind, by J. F. van Bemmelen (pp. 7, 8); Turkestan Autogamous Rye, by B. M. Bensin (p. 8); Genetic Studies of the Transplantation of Tumors—IV, Linkage in Tumor 19308A, by J. J. Bittner (p. 9); Preservation, Storage, and Artificial Germination of Rhododendron Pollen, by C. G. Bowers (p. 10); A Survey of Bud Mutations among Deciduous Fruit Varieties, by J. T. Bregger (pp. 10–12); Specific Suppressors in Drosophila, by C. B. Bridges (pp. 12–14); The Inheritance of Resistance to Bunt in Wheat Hybrids, by F. N. Briggs (pp. 14–16); Structural Changes in the Chromosomes of Maize, by R. A. Brink and D. C. Cooper (pp. 16, 17); The Transmission of Genes Affecting Pollen-Tube Growth in Datura, by J. T. Buchholz and A. F. Blakeslee (pp. 18, 19); The Association of Non-homologous Parts in a Chromosomal Interchange in Maize, by C. R. Burnham (pp. 19, 20); Male Sterility in Nicotiana, by M. Christoff (p. 20); Some Cytological and Genetical Studies in the Genus Melilotus, by A. E. Clarke (pp. 20, 21); Principles for a Joint Attack on Evolutionary Problems, by J. Clausen (pp. 21–23); Cytological and Genetical Features of Monosomic Derivatives in Nicotiana, by R. E. Clausen (pp. 23–25); The Fulfillment of Predictions as to Chromosome Configuration in Hybrids of Oenothera, and Its Significance, by R. E. Cleland (pp. 25, 26); Genetic Studies in Hare-lip, by A. M. Cloudman (p. 26); Inheritance of Sex in Oysters, by W. R. Coe (pp. 26–28); Prevalence and Origin of Fatuoids in Fulghum Oats, by F. A. Coffman and J. W. Taylor (pp. 28, 29); Variation in Fertility of Dove Hybrids in Successive Generations, by L. J. Cole (pp. 29, 30); Morphological and Cytological Characteristics of Triploid Pineapples, by J. L. Collins (p. 30); One Lethal Factor in Sheep, by G. K. Constaninescu (p. 31); The Importance of the Genus Partula for the Problem of Heredity and Environment in Nature, by H. E. Crampton (p. 31); Certain Principles of Pysiological Genetics, by W. J. Crozier and G. Pincus (pp. 31, 32); Genetic Association between Qualitative and Quantitative Characters in the Tomato, by T. M. Currence (pp. 32–34); Genetics of Sexual Dimorphism in Plumage, by C. H. Danforth (pp. 34–36); Genetic Investigations in Cultivated Fruits, by C. D. Darlington, M. B. Crane, and W. J. C. Lawrence (pp. 36–38); The Genetics and Cytology of Triploids and Tetraploids in Oenothera, by B. M. Davis (pp. 38–40); Melanic Pigmentation of the Mammary Glands of Black Breeds and a Red Breed of Pigs, by A. Deakin (pp. 41, 42); Changes in the Instability of Miniature-3 Gene of Drosophila during Ontogeny, by M. Demeree (p. 43); The Genetical Study of Natural Populations of Helix, by C. Diver (p. 43); A Morphological Study of the Short-tail in Mice (pp. 43, 44) and Heredity of Cancer Susceptibility in Mice (pp. 44, 45), both by N. Dobrovolskaia-Zavadskaia; Change in Domi-

nance of Genes Lying in Duplicating Fragments of Chromosomes, by T. Dobzhansky and A. H. Sturtevant (pp. 45, 46); General Scheme Concerning the Mechanism of Organic Evolution Taken from the Standpoint of Modern Genetics (pp. 46, 47) and Step Allelomorphism and the Theory of Centres of the Structure of the Gene (p. 47), both by N. P. Dubinin; Chromosome Elimination during Cleavage in the Eggs of Sciara, by A. M. Du Bois (pp. 47, 48); Studies on the Mechanism of Crossing Over in Drosophila—I, Experiments with Attached-X Chromosomes, by S. Emerson and G. W. Beadle (pp. 48, 49); *Crepis nicaeensis* × *Crepis setosa* and Some of the Derivatives, by S. L. Emsweller (pp. 49, 50); Multiple Association of Chromosomes and an Instance of Fragments in Rosa, by E. W. Erlanson (pp. 50, 51); The Genetics of the Ear of the House Mouse, by H. W. Feldman (pp. 51, 52); The Morphology of the Pollen Grains of Petunia in Relation to Hybridity, Polyploidy, and Sterility: A Preliminary Communication, by M. C. Ferguson (pp. 52, 53); Family Investigations on the Heredity of Eye Color in Man, by G. P. Frets (pp. 53–57); Fruit Characteristics of Autotetraploids in Citrus, by H. B. Frost (pp. 57, 58); The Mean of the Genetic Analysis for Theoretical Resistance Studies [trans. title], by W. H. Fuchs (p. 58); Reaction of a Wheat Cross to Three Physiologic Forms of Bunt, by E. F. Gaines (pp. 58, 59); The General Bearings of Recent Research in Oenothera, by R. R. Gates (p. 59); Breeding Habits of the Louisiana Deer, by W. H. Gates (pp. 59, 60); Chromosome Relations in Somatic and Meiotic Divisions in Violet Species-Hybrids, by A. Gershoy (p. 60); Heredity in Guinea Fowls [trans. title], by A. Ghigi (pp. 60–62); A Study of Dominant Mosaic Eye-Color Mutants in Drosophila, by H. B. Glass (pp. 62, 63); Somatic Segregation of an Enviromental Character (Hardshell) in Pure Lines of Beans, by W. O. Gloyer (pp. 63–65); Genetical Engineering, by H. D. Goodale (pp. 65, 66); An Analysis of Mendelian Phenotypes in the Goldfish, by H. B. Goodrich and R. Nichols (pp. 66, 67); Chromosome Unbalance and the Asynaptic Condition as Induced in Nicotiana by X–radiation, by T. H. Goodspeed (pp. 67–69); Meiosis as a Genetic Character, by J. W. Gowen (pp. 69, 70); Inheritance of Weight in a Mouse Interspecific Cross, by C. V. Green (p 71); Experimental Methods in Taxonomy, by J. W. Gregor (pp. 71–73); The Nature of Growth Factors in Domestic Breeds of Cattle, by P. W. Gregory (pp. 73–75); On the Peculiar Inflammatory Diseases of the Secondary Canals of the Nose and Ears [trans. title], by H. Grueneberg (p. 75); On Biological Life Tables, by E. T. Gumbel (p. 75); The Nature of the Genes in Relation to Mutation and Evolution, by A. L. Hagedoorn (pp. 76–78); The Inheritance of Fertility in the Rabbit, by J. Hammond (pp. 78, 79); The Temperature-Effective Period for the Lengthening of the Vestigial Wings of Drosophila, by M. H. Harnly (pp. 79–81); The Genetics of Stem Rust Resistance in Wheat, by H. K. Hayes (pp. 81–83); Crossing Production and Exhibition Rhode Island Reds, by F. A. Hays (p. 83); The Relative Growth Function in its Application to the Individual and to the Group, by A. H. Hersh (pp. 84, 85); Differential Sex Mortality and its Genetic Basis, by S. J. Holmes (pp. 85, 86); The Manner of Inheritance of Smut Reaction in Maize, by M. M. Hoover and R. J. Garber (pp. 86, 87); The Production of Mutations in American Upland Cotton by Radiations, by W. R. Horlacher and D. T. Killough (pp. 87–90); The Relationship of Chromosomal Irregularities in Megasporogenesis to the Fertility and Fruitfulness of Varieties of Malus, by F. S. Howlett (pp. 90, 91); The Flexed Tailed Mouse, by H. R. Hunt (pp. 91–93); Genetics of Evolution, by C. C. Hurst (pp. 93–95); Observations Bearing on the Mechanism of Meiosis and Crossing Over, by C. L. Huskins (pp. 95, 96); Eight New Mutations in the Domestic Fowl, by F. B. Hutt (pp. 96, 97); Modifying Factors in Guinea Pigs, by H. L. Ibsen (pp. 97–101); Cal-

culating Linkage Intensities from F_3 Data, by F. R. Immer (pp. 102, 103); On Heritable Individual Differences in the Biochemical Composition of the Red Blood Cells in Dove Hybrids, by M. R. Irwin (pp. 103, 104); The Interaction of Specific Genes Determining Sex in Dioecious Maize, by D. F. Jones (pp. 104–107); Problems of Multiple Allelomorphism in Man [trans. title], by G. Just (p. 107); Chromosome Structure in Drosophila, by B. P. Kaufmann (p. 107); Chromosomal Aberrations as a result of Transgenation, by E. J. Kharecko-Savitzkaya (pp. 107, 108); Mutations in a Strain of Captive Gray Norway Rats, by H. D. King (pp. 108–110); The Origin and Classification of the Domestic Fowl, by C. W. Knox (p. 110); Genotypic and Phenotypic Sex Determination in the Tooth Carp [trans. title], by C. Kosswig (pp. 110, 111); Cytogenetics of a Nicotiana and a Triticum Triple Hybrid, by D. Kostoff (p. 111); Observations on the Genetics of the Potato, by F. A. Krantz (pp. 111, 112); Genetic Selection for Resistance to Fowl Typhoid in the Chicken, by W. V. Lambert pp. 113, 114): Concerning the Existence of Genes with a Specific Effect upon One Germ Layer, by W. Landauer (pp. 115–118); Comparative Cytogenetic Studies of Tetraploid Tomatoes from Different Origins, by E. W. Lindstrom and L. M. Humphrey (pp. 118, 119); Tumors in a Cross between Two Strains of Mice, by C. C. Little (pp. 119, 120); The Law of Evolution, by W. H. Longley (pp. 120–123); The Amount and Kind of Inbreeding which Has Occurred in the Development of Breeds of Livestock, by J. L. Lush (pp. 123–126); Further Studies on the Inheritance of Tumor Susceptibility in Mice, by C. J. Lynch (p. 126); Cytological Observations in Zea on the Intimate Association of Non-homologous Parts of Chromosomes in the Mid-prophase of Meiosis and Its Relation to Diakinesis Configurations, by B. McClintock (pp. 126–128); Mouse Leukemia, by E. C. MacDowell, M. N. Richter, and J. S. Potter (pp. 128, 129); An Apparently Inseparable Association of One Type of Rust Resistance with a Peculiar Susceptibility to Heat Injury in Wheat, by E. S. McFadden (pp. 129, 130); The Application of Statistics to the Problem of Inheritance of Cancer, by M. T. Macklin (pp. 130–132); The Northern Spy Apple, a Parent in Breeding New Varieties, by W. T. Macoun (p. 132); The Effects of Inbreeding and Crossbreeding on Swine, by H. C. McPhee (pp. 132, 133); The Inheritance of Some Plant Colors in Brassica, by R. Magruder and C. H. Myers (pp. 133, 134); Genetic and Cytological Studies in Hybrids of Zea and Tripsacum, by P. C. Mangelsdorf and R. G. Reeves (pp. 134, 135); Genetic Behavior of a Closed X Chromosome of Drosophila, by L. V. Morgan (pp. 135–137); The Occurrence and Use of Haploid Plants in the Tomato with Especial Reference to the Variety Marglobe, by G. Morrison (pp. 137–139); The Synthesis of Galeopsis, by A. Müntzing (p. 139); Leaden, a Recent Color Mutation in the House Mouse, by J. M. Murray (pp. 139, 140); Hybrid Emergence in Grouse Locust Color Patterns, by R. K. Nabours (p. 140); Metaxenia and Xenia in Apples, by B. R. Nebel (pp. 140, 141); Mental and Physical Differences in Identical Twins Reared Apart, by H. H. Newman (pp. 141, 142); Metaxenia in the Date Palm and Its Genetic Implications, by R. W. Nixon (pp. 142, 143); Regional Differences in Crossing Over as a Function of the Chromosome Structure, by C. A. Offermann and H. J. Muller (pp. 143–145); Genetic and Cytological Correlation of Chromosomal Aberrations of Drosophila, by C. P. Oliver and E. W. Van Atta (pp. 145–147); A Cytological Map of the X Chromosome of Drosophila, by T. S. Painter and H. J. Muller (pp. 147, 148); Variability of Sweet Corn Hybrids as Affected by Genetic Constitution, by J. B. Park, A. Anderson, and M. T. Meyers (pp. 148–150); Insect Resistance in Crop Plants, by J. H. Parker and R. H. Painter pp. 150–152); The Mechanism of Mosaic Formation in Drosophila, by J. T. Patterson (pp. 153–155); Conservation of a Morphological Individuality of the Chromosomes

at the Resting Nucleus, by S. de Toledo Piza, jr. (pp. 155, 156); New Evidence of the Production of Mutations by High Temperature, with a Critique of the Concept of Directed Mutations, by H. H. Plough and P. T. Ives (pp. 156–158); Temperature as a Tool of Research in Phenogenetics: Methods and Results, by C. R. Plunkett (pp. 158–160); Cytological Aberrations in Triticum, by LeR. Powers (pp. 160, 161); The Occurrence of Gene Mutations in Paramecium, by D. Raffel (p. 162); Congenital Protein Hypersensitiveness, by B. Ratner (pp. 162–164); Inheritance of Resistance to Loose and Covered Smuts in Hybrids between Certain Susceptible Oat Varieties and Black Mesdag, by G. M. Reed (pp. 164, 165); Sex and Intersex in Pigeons, by O. Riddle (pp. 165, 166); Two Modes of Evolution in the Horse, by R. C. Robb (pp. 166–168); Inheritance of Resistance to Disease in Animals, by E. Roberts (pp. 169, 170); Inheritance in Barley, by D. W. Robertson (pp. 170, 171); Remote Ancestral Characters Appearing in First Generation Hybrids of Citrus and Poncirus, by T. R. Robinson (pp. 171–173); Species Hybrids in Paeonia, by A. P. Saunders and G. L. Stebbins (pp. 173–175); Variability and Heredity in Beta, by V. F. Savitzky (pp. 175, 176); The Production of Vestigial and Sterile Sex Organs through Sex-Reversal and Neutral Sexual States, by J. H. Schaffner (pp. 176, 177); The Genetic Basis of Resistance to Paratyphoid in Mice, by R. G. Schott (pp. 177, 178); Dependence of the Size of Xenoplastically Induced Organs upon the Size of the Host, O. E. Schotté (p. 178); Inheritance Studies of Anthracnose Resistance in Beans [trans. title], by F. Schreiber (p. 178); The Developmental System Affected by the Genes for Eye Color in Drosophila, by J. Schultz (pp. 178, 179); Intermediate Aphids and the Time-of-Determination Theory, by A. F. Shull (pp. 180–182); Linkage and the Criteria of Independence of Genes in Oenothera, by G. H. Shull (p. 182); Complete Elimination of Certain Classes of Gametes in Zea, by W. R. Singleton (pp. 182–184); The Genetic Basis of Dimensional Traits in Cucurbita Fruits, by E. W. Sinnott (pp. 184, 185); Cytological Mechanism of Segregation in the Progeny of an Allotetraploid Aquilegia, by M. Skalińska (pp. 185–187); Parthenogenesis and Haploidy in Grasshoppers (Acrididae), by E. H. Slifer and R. L. King (p. 187); Genetic Studies on Selective Segregation of Chromosomes in Sciara, by H. B. Smith (pp. 187, 188); The Effect of X-rays on the Fertility of the Male House Mouse, by G. D. Snell (p. 188); Sex-linked Inheritance in Drosophila, by W. P. Spencer (pp. 188–190); Problems in the Genetics of Phytopathogenic Fungi, by E. C. Stakman (pp. 190–192); The Development and Minute Structure of Certain Hereditary Tumors in Drosophila, by M. B. Stark (p. 192); The Genetics of Modified Endocrine Secretion and Associated Form Patterns among Dog Breeds, by C. R. Stockard (pp. 193, 194); The Inheritance of Cataract and Allied Eye Defects in the House Mouse, by L. C. Strong (p. 195); A Study of Interspecific Hybrids of Vicia, by I. Sveshnikova (p. 195); Recapitulation of Seedling Characters by Nucellar Buds Developing in the Embryo Sac of Citrus, by W. T. Swingle (pp. 196, 197); An Inhibitor of Gold Color in Chickens, by L. W. Taylor (pp. 197–199); Temperature Modifications of Pigmentation in Different Races of Epilachna, by H. Timoféeff-Ressovsky (pp. 199, 200); The General Meiosis Problem in the Light of New Facts and Its Signification for the Chromosomic Theory of Heredity, by M. V. Tschernoyarow (p. 200); Inheritance of Thyroid-Size and Thyroid-Structure in Six Crosses of Pure-bred Dogs, by E. M. Vicari (pp. 200, 201); On the Sex Influence of Autosomally Determined Eye Characters and on the Question Are There Hereditary Bases for Bylateral-Asymmetrical and Unilateral Eye Characters [trans. title], by P. J. Waardenburg (pp. 201–203); Autosomal Characters Independently Inherited in the Domestic Fowl, by D. C. Warren (pp. 203–205); Inbreeding in

White Leghorn Fowls, by N. F. Waters (pp. 205, 206) ; A Theoretical and Experimental Analysis of Crossing Over, by A. Weinstein (pp. 206–208) ; The Value of the European Grape in Breeding Grapes for New York State, by R. Wellington (pp. 208, 209) ; Genetic Interrelationships of Some Foliage, Pod, and Cotyledon Factors in Pisum, by O. E. White (p. 209) ; Male Biparentalism in Habrobracon, by A. R. Whiting and M. M. Torvik (pp. 209, 210) ; Genetic Analysis of Synapsis and Maturation in Eggs of Habrobracon, by P. W. Whiting and K. A. Gilmore (pp. 210, 211) ; Inheritance of Mental Aptitudes in Dogs, by L. F. Whitney (pp. 211, 212) ; The Importance of the Parental Genotype in the Breeding of Fruits, by A. N. Wilcox (pp. 212, 213) ; The Technique of Securing and Hatching Sexual Eggs for Use in Studying Biparental Inheritance in Cladocera, by T. R. Wood and A. M. Banta (pp. 213–215) ; Variation and Chromosome Behavior in Fragaria, by S. H. Yarnell (pp. 215, 216) ; Genetic Aspects of a Socially Important Primate Behavior Pattern, by R. M. Yerkes (pp. 216, 217) ; The Analysis of Body Stature in Drosophila, by S. Zarapkin (pp. 217, 218) ; and The Effect of Long Continued Subjection to Constant Temperatures in Darkness upon Inbred Bar-eyed Drosophila, by C. Zeleny (p. 218).

Recent advances in cytology, C. D. Darlington (*Philadelphia: P. Blakiston's Son & Co., 1932, pp. XVIII+559, pls. 8, figs. 109*).—"The present work attempts to describe one aspect of cytology, the study of the nucleus and the chromosomes in plants and animals." The introduction discusses the nucleus, the cell and the organism, reproduction, and heredity. Succeeding chapters consider mitosis, the constancy and variation of the chromosomes; meiosis in diploids and polyploids, in structural hybrids, and in undefined hybrids; the behavior and evolution of polyploids; the chromosomes in heredity and crossing over; the theory of meiosis; the mechanics of chromosome behavior; abnormalities of meiosis; permanent diploid hybrids; apomixis; and the evolution of genetic systems. Cytological interpretations and recent improvements in technic are treated in appendixes, which also include a glossary and an extensive bibliography.

Note on the cytology of Prunus rootstocks, A. A. Moffett (*Jour. Pomol. and Hort. Sci., 10 (1932), No. 3, pp. 181–183, figs. 4*).—A total of 48 diploid chromosomes was found at the John Innes Horticultural Institution in the root tip cells of common plum, common Mussel, narrow leaf shiny Mussel, Brompton, Brussels, and St. Julien A plum stocks, with 40 in St. Julien B and 16 in *P. tomentosa.*

Compatibility of certain Nicotiana species, F. A. McCray (*Genetics, 17 (1932), No. 6, pp. 621–636, figs. 6*).—The compatibility of 21 species of Nicotiana is reported on from tests of 195 different combinations made between them at Harvard University, and 14 new hybrids are listed. It seemed that crosses may be more successful if the species with the larger chromosome number serves as the female parent. This observation was also supported by evidence obtained from a study of 79 other hybrids included in East's summary (E. S. R., 60, p. 324). The suggestion that the hybrids between these species more often closely resemble the parent having the higher chromosome number than the other parent was also supported. When the 93 hybrids were classified in a frequency table according to the taxonomic position of the parent species, no correlation could be detected between taxonomic relationship and ability to cross with other species. Intergroup crosses were about as numerous as those between species within a group. The species *N. tabacum, N. glauca,* and *N. bigelovii* entered into the most crosses.

Inheritance of monosomics in Nicotiana rustica, W. E. Lammerts (*Genetics, 17 (1932), No. 6, pp. 689–696, figs. 2*).—Seven monosomics ($2n-1$ types) are

described. The percentage of functional $n-1$ gametes varied in individual cases, but due to lagging usually exceeded 50 per cent, although in two cases only 31 per cent were $n-1$. Only three types were transmitted in appreciable frequency through the pollen. No nullosomic plants ($2n-2$) were obtained even after selfing with a limited quantity of pollen on shortened styles. It appeared that the hybrid derivatives obtained by selfing fertile plants in the back-cross of an *N. rustica-paniculata* hybrid (E. S. R., 67, p. 376) to *N. rustica* return to the chromosome number of *N. rustica*, mainly because pollen grains with incomplete chromosome sets rarely function.

A partially fertile triple species hybrid in Nicotiana, F. A. McCray (*Genetics, 17 (1932), No. 6, pp. 660–673, figs. 10*).—A triple species hybrid was produced by using *N. langsdorffii* pollen on F_1 of *N. rustica*×*N. paniculata*. Four plants were grown which resemble the F_1 parent in being intermediate between *N. rustica* and *N. paniculata*, but in certain respects were more like *N. rustica*. The absence of definite *N. langsdorffii* characters was explained by a cytological study of the triple hybrid. Capsules were produced when the triple species hybrid plants were pollinated by each of the three pure species, and also when selfed.

Inheritance of characters in sorghum.—I, Chlorophyll deficiencies, G. N. R. Ayyangar and M. A. S. Ayyar (*Indian Jour. Agr. Sci., 2 (1932), No. 3, pp. 266–270, pls. 2*).—Types of chlorophyll deficiencies observed in sorghum at the Agricultural Research Institute, Coimbatore, included lethal pale green, virescent whites, pure albinos, and lingering lethal pales, all lethal in varying degree, and surviving pale. The five types described were recorded as simple recessives to normal green. In lingering lethal pale, distorted 3:1 ratios were set to the presence of a zygotic lethal factor. Chlorophyll estimations of the various types with their relative surviving normal greens revealed no chlorophyll in pure albinos, 5 per cent in virescent whites, 40 in lethal pale green, and 51 per cent in lingering lethal pales.

A factorial analysis of some quantitative characters in a cross between T. vulgare var. Sonora and T. compactum var. Club, C. I. 4534, J. W. Elliott (*Jour. Amer. Soc. Agron., 24 (1932), No. 10, pp. 764–778*).—No genetical difference between Club (C. I. 4534) with short spikes and Sonora wheat with long spikes, in respect to the number of spikelets or internodes to the spike was observed in a Cornell University study. Results obtained in the parental, F_1, F_2, F_3, and F_4 generations showed that the spike length interaction was bifactorial in nature. The gene inherited from Sonora exerted a greater influence upon spike length than did the one from Club. The presence of a shortening or lengthening inhibiting gene was not evident.

A correlation of ring-shaped chromosomes with variegation in Zea mays, B. McClintock (*Natl. Acad. Sci. Proc., 18 (1932), No. 12, pp. 677–681, fig. 1*).—The presence of ring-shaped chromosomes in variegated corn plants, involving genes associated with sun-red plant color, purple plant color, and brown midrib (bm_1), is described from studies at the Missouri Experiment Station.

A peach mutation, C. F. Kinman (*Jour. Heredity, 23 (1932), No. 11, pp. 453–456, figs. 3*).—An account is given of a yellow leafed bud mutation of the Johnson peach found in Sutter County, Calif. Open-pollinated seeds from the mutant branch gave rise to normal and yellow leafed progeny in about equal proportions, suggesting that the reproductive as well as the somatic tissues were affected in this mutation.

Sheep breeding, J. W. Wilson (*South Dakota Sta. Rpt. 1932, pp. 10, 11*).—Reference is briefly made to studies of the production of a strain of sheep with

good fleeces, open faced, and vigorous, but in a large percentage of the cases without tails.

A genetic study of the effects of intensively inbreeding Berkshire swine, E. G. Godbey and L. V. Starkey (*South Carolina Sta. Rpt. 1932, pp. 42, 43*).—Data are briefly summarized.

Contributions to the genetics of the domestic rabbit (*Carnegie Inst. Wash. Pub. 427 (1932), pp. [5]+50, pls. 12*).—Two papers are included, as follows:

I. *English and Dutch spotting and the genetics of the Hotot rabbit,* W. E. Castle (pp. 1–13).—The author describes the English and Dutch patterns in rabbits as inhibitors of pigmentation, including the variations which occur in these patterns. The combined effects of the English and Dutch genes are also discussed, and the results of crosses are presented.

The Hotot, a breed of large white rabbits having a circle of colored fur surrounding each eye (colored), is considered as synonymous genetically with the synthetic English-Dutch race, which arose from a crossover between the English and White-Dutch genes. Similar results were obtained in several types of matings of the Hotot and English-Dutch races.

In a postscript the bearing of these experiments on step allelomorphism is dicussed.

II. *Albino allelomorphs of the rabbit with special reference to blue-eyed chinchilla and its variations,* P. B. Sawin (pp. 15–50).—A more extensive report is given of the data on which a paper previously noted (E. S. R., 68, p. 317) was based, including reference to a new variation involving an increase in the width of the agouti band on the secondary guard hairs and wool hairs, which behaves as a simple recessive to the normal.

Size inheritance in rabbits; the backcross to the large parent race, W. E. Castle (*Jour. Expt. Zool., 60 (1931), No. 3, pp. 325–338, figs. 6*).—A study is reported of the weights at 80, 150, 275, and 365 days of age of large and small races of rabbits, the F_1s between them, and the back-crosses produced by mating the F_1s to the large and small races. Environmental effects tended to obscure the expression of the genetic factors for the size of different groups at 80 days of age, but the relative genetic variability of each group was revealed at the later ages. The back-cross populations were more variable than the parent and F_1 populations, suggesting a multiple-factor hypothesis for size inheritance. The population produced by back-crossing the F_1s to the large race was surprisingly less variable than the opposite back-cross.

Genetic, distributional, and evolutionary studies of the subspecies of deer mice (Peromyscus), F. B. Sumner (In *Bibliographia Genetica. 's Gravenhage (The Hague): Martinus Nijhoff, 1932, vol. 9, pp. 1–106 figs. 24*).—A summary is presented of investigations, conducted at the Scripps Institution of Oceanography of the University of California, on the inheritance of characters in the various subspecies of the deer mouse found in various parts of North America, including special reference to the relation of racial differences to environment.

Sex-differences in crossing-over and chiasma-frequency in the mouse, P. C. Koller (*Nature [London], 130 (1932), No. 3276, p. 242, fig. 1*).—An examination of chiasma formation in male and female mice showed a greater frequency in females, supporting the partial chiasma-type hypothesis of crossing over, since crossing over has been found more frequent in female mice.

The sex incidence of chiasma frequency and genetical crossing-over in the mouse, F. A. E. Crew and P. C. Koller (*Jour. Genetics, 26 (1932), No. 3, pp. 359–383, pls. 2, figs. 17*).—The chromosome picture presented by the somatic tissue at different stages of cell division of 1- to 3-day-old male and

female mice is described from the University of Edinburgh. The number of chromosomes was 40, consisting of an unequal pair in the males.

The partial chiasma-type hypothesis is based on exchange of the segments between the homologous chromatids occurring before the diplotene stage. The number of chiasmata observed in the chromosomes of males and females at the diplotene and metaphase stages was found to be greater at both stages in females, in which the crossover frequency is also greater. It appears that the number of chiasmata observed in the metaphase stage indicates the number of chiasmata in the diplotene stage when crossing over probably occurs.

The chiasma frequency per bivalent in a 6-weeks-old male mouse was greater than in similar material from an older animal, agreeing also with the suggestion of a lesser amount of crossing over occurring as age advances.

The work by Koller noted above is described in detail.

On the effect of removal of the litter upon the reproductive rate of the female mouse, F. A. E. Crew and L. Mirskaia (*Quart. Jour. Expt. Physiol., 20 (1930), No. 3, pp. 263–266*).—The number of young produced by mice suckling their young was compared with the number produced by dams from which the young were removed at birth. Forty females, many of which were litter sisters, were kept together in the same box and with the same male. The mothers suckling their young produced an average of 64.21 young per month as compared with 121.27 young for those dams which were not permitted to suckle their young.

Integumental grafting as a means of analyzing the factors determining the secondary sexual characters of the Leghorn fowl, A. W. Kozelka (*Jour. Expt. Zool., 61 (1932), No. 3, pp. 431–495, pls. 5, fig. 1*).—Data are reported on the characteristics and development of 532 homoioplastic and 95 autoplastic grafts of various tissues on fowls. In general such tissues as comb wattles and spurs developed best at their natural locations, although spurs developed well on all parts of males except the abdomen. In homoioplastic grafts there was a distinct correlation between their persistence and the inbreeding of the donor and recipient. The importance of physiological factors was indicated in several ways, i. e., by the absorption of certain homoioplastic grafts, sex of donor and recipient, and ultimate size and development of grafts on the two sexes.

The prenatal growth of the albino rat, A. W. Angulo y González (*Anat. Rec., 52 (1932), No. 2, pp. 117–138, figs. 6*).—A study is reported of the prenatal growth of the albino rat in first litters of females from 110 to 190 days of age. It was evident that the effect of size of litter became more pronounced as age advanced. It slightly affected the growth of the fetus from the seventeenth to nineteenth day and showed a marked effect toward the end of the gestation period.

Study was also made of the distribution of the fetuses in the uterus and the changes in the position as age advanced.

The beta-hormone or kythin of the corpus luteum and its test [trans. title], J. S. Patel (*Magyar Biol. Kutató Intézet Munkái (Arb. Ungar. Biol. Forsch. Inst.), 4 (1931), No. 2, pp. 483–494, figs. 5; Eng. trans., pp. 488–492*).—The administration of an extract of corpus luteum to ovariectomized mice was found to produce large cylindrical mucous cells in the vagina characteristic of pregnancy. The substance in the corpus luteum extract causing this reaction is called kythin. It was not destroyed at 100° C., but was destroyed by saponification with KOH. Kythin can be extracted from the corpus luteum and the blood serum of certain pregnant animals. Kythin can not be separated from oestrin, but the kythin can be easily destroyed by saponification.

The inhibition of oestrus by corpus luteum extracts, J. S. Patel (*Quart. Jour. Expt. Physiol., 20 (1930), No. 3, pp. 245–262, pl. 1, figs. 2*).—The results are reported of experiments in which an extract of cattle corpora lutea was administered to mice and found to prevent the occurrence of oestrum as determined by vaginal smears. No permanent injury to the ovaries was evident, however, as the mice later bore normal litters. It appeared that the kythin inhibited the secretion of oestrin by the ovary. It also appeared that kythin inhibited the secretion of the oestrogenic substance by the pituitary.

A comparison of the descendants of lead-poisoned male guinea-pigs with those from untreated animals of the same closely inbred strains, E. C. Colin (*Jour. Expt. Zool., 60 (1931), No. 4, pp. 427–484, figs. 6*).—In a series of experiments conducted at the University of Chicago, weighed amounts of lead acetate were fed to 58 male and 5 female guinea pigs, causing in many cases characteristic symptoms of lead poisoning, but motile sperm were found in the testes of nearly all the males. There were no significant differences in litter size or in the birth or weaning weights of the young having either parent in the treated and control groups. Some differences in the mortality at birth and between birth and weaning were observed, but the evidence that the differences were due to feeding lead to the sire was not convincing. Lead administration to females increased the frequency of abortion.

FIELD CROPS

[Field crops research in Arizona], R. S. Hawkins, I. A. Briggs, M. C. Smith, W. E. Bryan, E. H. Pressley, W. G. McGinnies, and A. A. Nichol (*Arizona Sta. Rpt. 1932, pp. 72–76, 98, 99, 103–108, 131, 132*).—Investigations with field crops reported on briefly from the station and substations comprised variety trials with wheat, barley, corn, and cotton; breeding work with wheat for bunt resistance and with cotton; inheritance of grain texture in wheat and of economic characters in pure lines of alfalfa; cotton production and soil and climatic environment; planting tests with cotton, and with cowpeas and sesbania for green manure; a time-of-cutting experiment with alfalfa varieties; the effect of the curing process on vitamins A and D content of alfalfa; a study of the relationship between the supplies of nutrients in cotton plants, as indicated by certain plant properties, and the abscission of the young bolls; range studies in cooperation with the U. S. Forest Service; and the control of rayless goldenrod.

[Report of field crops work in Michigan] (*Michigan Sta. Bien. Rpt. 1931–32, pp. 32, 33, 53, 54*).—Brief accounts of investigations, not noted earlier, describe the merits of Spartan barley for combining, Katahdin potatoes as good yielders, alfalfa as a pasture for dairy cows, the production of certified seed potatoes in Michigan, and harvesting soybean hay with the binder, and report on fertilizer experiments with late potatoes, beans, alfalfa on sandy soils, and pasture.

[Agronomic experiments in Montana] (*Montana Sta. Rpt. 1931, pp. 10–15, 21–25, 28–30, 74–80, 84–89, 90–97, figs. 5*).—The progress of research with field crops at the station and substations (E. S. R., 64, p. 216; 66, p. 426) is reviewed again. The different experiments for which results are reported included variety tests with corn, spring and winter wheat, barley, oats, rye, flax, beans, alfalfa, and grasses for reseeding; trials of small grains for hay; breeding work with winter and spring wheat, oats, barley, corn, and alfalfa; introduction and distribution of improved crop varieties; cultural (including planting) experiments with spring and winter wheat, oats, barley, seed flax, alfalfa,

sweetclover, grasses, and potatoes; tuber indexing, storage of seed, comparison of dry land v. irrigated seed, and a fertilizer test, all with potatoes; crop rotations on dry land and under irrigation; response of wheat, corn, oats, and seed flax to different soil preparations; methods of preparing and cultivating fallow, and the response of different crops to fallow and to continuous culture; effects of legumes and of pasturing livestock in rotations on crop yields; improvement of native sod by manuring and disking; seed testing and miscellaneous seed studies; and grading, smut dockage, and protein tests with wheat. Certain lines of work were in cooperation with the U. S. Department of Agriculture.

[Field crops experiments in South Carolina], H. P. Cooper, E. E. Hall, B. E. G. Pritchard, J. A. Riley, J. H. Mitchell, E. D. Kyzer, W. M. Lunn, C. H. Arndt, H. W. Barre, G. M. Armstrong, C. C. Bennett, E. C. Elting, J. P. LaMaster, C. S. Patrick, T. M. Clyburn, J. D. McCown, W. B. Albert, J. H. Beattie, S. J. Watson, W. B. Rogers, R. B. Carr, R. W. Wallace, and E. W. Faires (*South Carolina Sta. Rpt. 1932, pp. 21–23, 27–29, 36–39, 43, 44, 46–49, 51, 52, 57–60, 99–101, 102–104, 105–115, 119–126, 129, 130, figs. 6*).—Progress reports are rendered on agronomic investigations (E. S. R., 66, pp. 627, 629) carried on at the station and substations, in certain lines in cooperation with the U. S. Department of Agriculture, including variety trials with cotton, corn, oats, barley, soybeans, cowpeas, lespedeza, Crotalaria for soil improvement, winter legumes for cover crops, and pasture grasses; fertilizer experiments with cotton, oats, soybeans, sweetpotatoes, tobacco, winter legumes, and pasture; liming tests with different crops; legume cover crops, and manure v. green manure for cotton; green manures for corn; cultural (including planting) tests with cotton, corn, oats, sweetpotatoes, and carpet grass pasture; intercropping of corn and soybeans; cotton research embracing physiological studies, effects of soil moisture and temperature on germination and seedling growth, seed treatments, cold resistance of seedlings of varieties and strains, time of picking tests, and study of length and structure of fibers, especially as affected by soil moisture conditions; seasonal variation in yield and composition of pasture grass; chemical analyses of pasture plants for mineral content; a comparison of the cost of harvesting oats with a combine and a horse-drawn binder; controlled grazing of Napier grass; and experiments on the control of blue mold of tobacco. Fertilizer formulas are recommended for bright flue-cured tobacco and for plant beds.

[Agronomic studies in South Dakota], A. N. Hume and N. E. Hansen (*South Dakota Sta. Rpt. 1932, pp. 6–9, 22, 23*).—Continued experiments with field crops (E. S. R., 67, p. 30), reported on briefly from the station and substations, included breeding work with spring wheat for rust resistance, winter wheat, Hansen alfalfa, and Sibturk (Siberian × Turkestan) alfalfa; inheritance of earliness in spring wheat; variety and spacing (E. S. R., 67, p. 128) tests with flax; effect of phosphorus on wheat yields; crop rotations; and control of creeping Jennie by cultivation and chemicals.

[Field crops experiments in Washington], E. G. Schafer, O. E. Barbee, O. A. Vogel, E. F. Gaines, A. M. Schlehuber, C. S. Holton, A. L. Hafenrichter, C. L. Vincent, E. L. Overholser, H. M. Wanser, H. D. Jacquot, H. P. Singleton, L. L. Claypool, and C. A. Larson (*Washington Col. Sta. Bul. 275 (1932), pp. 11–15, 45, 46, 51–53, 55–57, 62, 63*).—Progress reports are given on various phases of agronomic research (E. S. R., 66, p. 730) carried on at the station and substations, and sometimes in cooperation with the U. S. Department of Agriculture. The work included variety tests with spring and winter wheat and barley, oats, rye, corn, flax, alfalfa, and sweetclover; breeding work with wheat for bunt resistance, rye, corn, potatoes, and sunflowers; inheritance

studies with wheat; cultural (including planting) experiments with winter and spring wheat and perennial grasses; storage and fertilizer tests with potatoes; irrigation experiments with wheat, corn, potatoes, and alfalfa; crop rotations; a study of the competition between alfalfa and sweetclover and cereals and grasses as companion crops; the determination of the composition of sweetclover stems and leaves; control of bindweed with chlorates; and pasture studies.

[Field crops experiments in West Virginia, 1930–1932] (*West Virginia Sta. Bul. 254 (1932), pp. 5, 6, 17–19, 20, 21, 22, 23, 24, 25, 30, 48, fig. 1*).—Progress is reported from agronomic research (E. S. R., 66, p. 528), carried on at the station and substations during the biennium ended June 30, 1932, embracing varietal trials with corn, wheat, oats, potatoes, and red clover (strains); breeding work with corn, oats for smut resistance, soybeans, sweetclover for low coumarin content, tobacco for resistance to root rot; fertilizer tests with corn, wheat, alfalfa, and pasture; growing wheat on soybean v. cowpea stubble; cutting tests with alfalfa; a lime requirement study with alfalfa; seed potato storage tests; and pasture experiments.

[Field crops research in Wyoming] (*Wyoming Sta. Rpt. 1932, pp. 5, 6, 31, 32, 33, 34, 35, 38, 39, 41*).—Progress results are given from experiments (E. S. R., 67, p. 30) at the station and substations, including variety tests with winter and spring wheat, oats, barley (E. S. R., 67, p. 379), corn, flax, potatoes, soybeans, field beans, garden beans for seed, alfalfa, millet, and miscellaneous forage grasses; cultural (including planting) experiments with winter and spring wheat, corn, and alfalfa; a seed selection test with field beans; comparison of dry land v. irrigated potatoes; response of sugar beets to superphosphate applications; crop rotations; pasture studies; control of quack grass by cultivation and chemicals; and a trial of safflower, an oilseed plant. Certain lines of work were in cooperation with the U. S. Department of Agriculture.

Analytical yield studies with cereals [trans. title], O. H. Frankel (*Züchter, 4 (1932), No. 4, pp. 98–109*).—A review is given of recent experiments concerned with the several components of yield, especially in populations in constant and varying spacings and under field conditions.

Activities of the [German] Cereal Variety Register Commission [trans. title] (*Züchter, 4 (1932), No. 10, pp. 245–254*).—Lists of varieties of cereals considered for registration in Germany include winter wheat 206 sorts, spring wheat 57, spring oats 167, winter barley 34, and spring barley 143.

Root nodule bacteria and leguminous plants, E. B. Fred, I. L. Baldwin, and E. McCoy (*Wis. Univ. Studies Sci. No. 5 (1932), pp. XXII+343, pls. 51*).—This monograph treats of the history of the Leguminosae in agriculture and their general characteristics, distribution, and importance; the occurrence of root nodules; the isolation and study, the morphology and life cycle, the cultural and biochemical characteristics, and the factors influencing growth and longevity of root nodule bacteria; species relationships; the formation, histology, and cytology of nodules; the relationship between leguminous plants and bacteria; the factors influencing nodule production; the economic importance of legume crops; and natural and artificial inoculation. Information is appended on distribution agencies, inspection, and the use and testing of artificial cultures. A comprehensive bibliography is included.

Trials with pedigree strains of herbage grasses (*Welsh Plant Breeding Sta., Aberystwyth, [Bul.], Ser. H, No. 13 (1926–1931), pp. [6]+121+[9], pls. 3, figs. 7*).—Several phases of forage research in progress at the station are reported on in the following papers: Yield, Palatability, and Other Studies on Strains of Various Grass Species, by R. G. Stapledon and W. E. J. Milton (pp.

1–79); The Influence of Nitrogenous Manures on the Chemical Composition of the Produce of Individual Grasses as Pasture, Hay, and Aftermath, by T. W. Fagan (pp. 80–92); and Variations in the Weight of Sheep—A Note as to Procedure (pp. 93, 94), and Preliminary Experiment to Test the Reaction of Sheep (Live Weight Increase) to Different Species and Strains of Grasses and Clovers and to Test the Yield and Other Characters of the Species as Such (pp. 95–121) (plus appendix tables), both by L. I. Jones.

The experimental error of the yield from small plots of "natural" pasture, J. G. Davies (*Aust. Council Sci. and Indus. Res. Bul. 48 (1931), pp. 22, figs. 6*).—An area (0.375 acre) of natural pasture was divided into $\frac{1}{2000}$-acre plats, and on each plat the dominant species were estimated, the herbage harvested separately, and the air-dry weight determined. The 18 combinations of unit plats assembled made plats ranging from 50 to 1,000 square links in area.

The standard error of a unit plat was found to be 32.48 per cent of the mean yield per plat. Increasing size of plat reduced standard error, but not to the expected extent. Pasture was shown to be much more variable in yield than the usual field crops. The optimum size of plat approximated 450 square links in area, and 5 by 90 links in dimension. The standard error of such a plat was 13.75 per cent of the mean yield. Under conditions of the experiment the minimum size of plat is 150 square links, and the dimensions 5 by 30 links; using the standard error to measure reliability of yields from smaller plats did not seem justified.

The botanical composition of herbage on a given plat, particularly the dominant species, was observed to influence greatly the yield from that plat. The different potential productiveness of the constituents species, together with the tendency toward aggregation into "societies" of limited area, may result in a mixed-yield population, especially where the plat is small. Increasing the plat size would tend to eliminate the influence of the "societies," because a larger plat would be the expression of more "societies." Since "societies" tend to be roughly circular in outline, a long plat would cut across more of them than a square plat.

Effects of fertilizers on the seasonal production of pastures, B. A. Brown (*Jour. Amer. Soc. Agron., 24 (1932), No. 11, pp. 898–908, figs. 2*).—The effects of different fertilizer treatments on the seasonal production of permanent pastures (E. S. R., 61, p. 430; 67, p. 236) at the Connecticut Storrs Experiment Station are reviewed for the 5-year period, 1927–1931.

The total production was increased greatly by fertilization, yet no treatment affected very markedly the proportion of the total feed produced in a given part of a season. During the period, plats receiving minerals plus nitrogen produced 252 feed units (17 per cent) per acre annually more than plats receiving minerals only, over two-thirds of this difference in favor of nitrogen being produced during the zenith period, May 15 to June 15, and the remainder before May 15. In the period after July 15, when pastures are much less productive, plats receiving minerals and nitrogen produced less both actually and proportionately than those receiving minerals only. Application of half of the nitrogen in July rather than all in April resulted in slightly less total feed but in about 8 per cent more grazing during the late summer months. Certain data obtained in 1931 indicated that the resting of pastures from the end of the zenith period until August is more important in securing late summer grazing than are the midseason applications of nitrogen.

The relative variability of corn crosses and varieties, L. E. Arnold and M. T. Jenkins (*Jour. Amer. Soc. Agron., 24 (1932), No. 11, pp. 868–871*).—

Differences in the amount of variability of (12) varieties, (53) single crosses, (22) inbred-variety crosses, and (49) double crosses, as measured by the standard deviations and coefficients of variation for plant height, ear height, total number of nodes, number of nodes below the upper ear, and number of kernel rows on the ears, were determined by the Iowa Experiment Station cooperating with the U. S. Department of Agriculture. The varieties were most variable, the inbred-variety crosses and double crosses were about intermediate and not significantly different, and the single crosses were least variable. All the differences between inbred-variety crosses and single crosses were significant. The inbred-variety crosses did not differ in variability from the parent variety in plant height, ear height, and nodes below the ear. Relations indicated between variability of double crosses and of their component single crosses were unimportant.

Cotton root development in certain south Louisiana soils, H. B. Brown, E. C. Simon, and A. K. Smith (*Louisiana Stas. Bul. 232 (1932), pp. 24, figs. 11*).—Studies of the development of the roots of cotton plants grown on two soil types revealed that cotton roots grow rapidly, the tap root under favorable conditions extending 0.5 in. per day. Roots of mature plants were thoroughly distributed in the top soil and extended into the upper subsoil to 1 ft. or deeper. Some roots penetrated the deeper subsoil layers, one being traced below a 7-ft. depth. The depth of the root system seemed to vary with the soil, most of the roots penetrating much deeper in Sharkey clay alluvial soil than in Lintonia bench land soil. Indications were that the root systems are more extensive in seasons with more rainfall and heavier boll weevil damage. While subsoiling resulted in deeper root growth, aerating the soil by augur holes or manuring did not cause deeper penetration. The slightly greater acidity of subsoil layers was not enough to affect root growth much, nor were there significant differences due to fertilizer treatment or to variety. Hard layers in the upper part of the subsoil seemed largely responsible for shallow root systems for plants growing on bench land soil in certain years.

A preliminary note on the contabescence of anthers in cotton, R. Sankaran (*Agr. and Livestock in India, 2 (1932), No. 3, pp. 297–308, pl. 1, figs. 4*).—Examination during two seasons of two pure lines of *Gossypium indicum* showed that the percentage of abortive anthers per flower exhibited a periodic seasonal fluctuation, the tendency being much greater in early-formed flowers than in later ones. Indications were that this diminution in contabescence might be due to the higher temperatures prevailing then and the senescence of plants at the later period.

List of publications on Jerusalem artichoke (Helianthus tuberosus L.), compiled by N. O. Fermeren (*Vsesoĭuzn. Inst. Rastenievod., Bibliot., Bibliog. Mater. (Inst. Plant Indus., Leningrad, Library, Bibliog. Contrib.) No. 1 (1932), pp. 48*).—The 400 titles included in the bibliography are listed in groups entitled general work; botany; cultivation; storage and uses; and chemistry and production.

Field peas for the Upper Peninsula of Michigan, B. R. Churchill (*Michigan Sta. Circ. 145 (1932), pp. 12, figs. 3*).—Practical information is given on varieties and production practices deemed suitable for growing field peas; on using the crop as feed for hogs and dairy cattle, and for human food, including a recipe for baked peas; and on diseases and insect pests.

The influence of sulphur compounds in breaking the dormancy of potato tubers, L. P. Miller (*Contrib. Boyce Thompson Inst., 3 (1931), No. 2, pp. 309–312, figs. 2*).—Ammonium dithiocarbamate, a sulfur compound related to thiourea, was found very effective in breaking dormancy of potato tubers.

concentrations of 1.25, 1, and 0.75 per cent giving very good results. Other effective compounds included thiosemicarbazide, thioglycollic acid, thioacetic acid, hydrogen sulfide, methyl disulfide, ethyl mercaptan, thioglycol, and various derivatives of dithiocarbamic acid.

Sesamum, W. Bally ([*Internatl. Rev. Agr.*], *Mo. Bul. Agr. Sci. and Pract.* [*Roma*], *23 (1932), No. 4, pp. 129–139*).—Information is given on the botany, origin, varieties, adaptations, culture, and harvesting of *S. indicum;* oil extraction; uses and composition of products; and world production and trade in the crop.

Breeding and genetics of sweetclover [trans. title], M. Ufer (*Züchter, 4 (1932), No. 4, pp. 91–97, figs. 5*).—The aims and progress of recent improvement work and inheritance studies with *Melilotus* spp. in different countries are reviewed, with remarks on value of the crop in Germany.

The tepary bean for hay production, H. H. Finnell ([*Oklahoma*] *Panhandle Sta., Panhandle Bul. 46 (1933), pp. 12*).—The characteristics, adaptations, and cultural and harvesting requirements of the tepary bean (*Phaseolus acutifolius latifolius*) are described, and experiments on growing the crop for hay are reported on.

Tepary beans, during the period 1924–1932, averaged 1,820 lbs. of hay per acre compared to 1,263 lbs. from Whippoorwill, the best cowpea variety. Tepary hay was cured and put up more easily than cowpea hay, which it equaled in composition and in feeding value (E. S. R., 65, p. 171) in a dairy ration. Seed production averaged 478 lbs. per acre during seven years. With May 29 as the average planting date and harvest October 3, the growing season averaged 127 days.

Best results for hay production were had after row crops such as sorghum. Tepary beans appeared to be more sensitive to the effects of a previous crop than to those of tillage methods. Effective weed control seemed essential to good results. In rotation experiments during six years beans ranked next to summer fallow as the best preparation for summer wheat. Wheat yields on bean land surpassed those on milo or corn stubble.

Studies in Indian tobaccos.—No. 7, The types of Nicotiana tabacum L., F. J. F. Shaw and K. Ram (*Indian Jour. Agr. Sci., 2 (1932), No. 4, pp. 345–357, pls. 6*).—The seventh number of this series (E. S. R., 66, p. 824) describes and classifies 18 additional (E. S. R., 23, p. 537) types isolated recently from samples collected in 1925 from leading tobacco-growing centers in India.

The influence of the lime status of volcanic ash soil on leaf quality of Vorstenlanden tobacco, H. A. Middelburg (*De Invloed van den Kalktoestand van Juvenielen Merapiaschgrond op eenige Kwaliteitseigenschappen van Vorstenlandsche Tabak. Proefschr., Landb. Hoogesch., Wageningen, 1932, pp. [9]+68, pl. 1, figs. 15, Eng. abs. pp. 64, 65; also Proefsta. Vorstenland. Tabak* [*Netherland East Indies*] *Meded. 75 (1932), pp. [2]+68, pl. 1, figs. 15, Eng. abs. pp. 64, 65*).—Tobacco was grown in pots on Merapi ash soil, important for tobacco in Java, and on weathered laterite soil adjusted to several levels of lime and of sulfur. The characteristics of the soils and their reactions to the treatments are detailed.

Application of lime resulted in a decrease in the solubility of phosphoric acid in 2 per cent citric acid, with a delay in growth and blooming, especially where phosphates were applied. With heavy lime treatments the leaf became more drab and even colored, although darker. Plants from a heavily limed seed bed soil continued to show better development and leaf quality in the field. The development of seedlings in unfertilized ash soil was also improved by liming and was injured by sulfur applications, their color being dark green on

limed soil and yellowish green with sulfur treatment. Analysis of drainage water showed that iron and aluminum were liberated in acid soil from which lime had been removed, and leaf spotting was a result. After heavier liming more chlorine leached from the soil, coinciding with a decrease in the chlorine in the leaf ash and improved fire-holding capacity.

Effects of meteorological factors on gluten content [of wheat] [trans. title], M. Briccoli (*Met. Prat., 12 (1931), No. 5, pp. 216–225*).—Cooperative studies on eight wheat varieties, coming from localities from northern Africa to Norway and tested by a series of ecological stations, showed environment to have a pronounced effect on gluten formation, the differences in means of all sorts between extreme stations always exceeding varietal differences at a single station. Gluten content was depressed by humidity and increased by temperature and light, and was closely correlated with specific weight of grain. The amount of gluten produced was not related to its quality. Quality of grain as indicated by gluten content was related inversely to yield per unit area.

Wheat in Tunisia [trans. title], F. Boeuf (*Ann. Serv. Bot. et Agron. Tunisie, 8 (1931), pp. IV+454, pls. 39*).—This monograph on wheat in Tunisia treats of the taxonomy, characteristics, origin, and centers of dissemination of wheat; describes varieties grown in Tunisia; discusses the genetics and improvement of the crop; describes the morphology and physiology of the plant, the climatic, soil, and soil moisture relations, phenological and ecological factors, and cultural methods and field practices; and cites statistics on the production and acreage of wheat and competing crops. A bibliography is included.

The number and weight of seeds produced by weeds, O. A. Stevens (*Amer. Jour. Bot., 19 (1932), No. 9, pp. 784–794*).—The total number of seeds produced per plant and the weight per 1,000 seeds are tabulated for numerous species of common weeds and other plants studied at the North Dakota Experiment Station. The agronomic significance of number and size of seed is discussed briefly.

Control of weeds in lawns with calcium cyanamid, D. G. Sturkie (*Jour. Amer. Soc. Agron., 25 (1933), No. 1, pp. 82–84, fig. 1*).—When calcium cyanamide was broadcast on Bermuda grass lawns at the Alabama Experiment Station at from 200 to 2,000 lbs. per acre in February, all weeds were killed by 800 lbs. or more per acre, and the grass was stimulated markedly when growth started in April. In May when Bermuda grass was growing vigorously, treatment with 1,000 lbs. or more killed all weeds including crabgrass, and 500 lbs. killed most of the weeds. While the Bermuda grass leaves were burned badly or killed, new growth showed marked stimulation from the nitrogen. Similar results were had on sods of carpet, Dallis, and centipede grasses. Method of application is deemed a problem in the use of calcium cyanamide.

HORTICULTURE

[Horticulture at the Arizona Station], A. F. Kinnison, W. E. Bryan, and E. H. Pressley (*Arizona Sta. Rpt. 1932, pp. 92–96, 108*).—Brief summations are presented on the results of studies of the irrigation and fertilizer requirements of grapefruit and oranges; on varietal tests of citrus; on the response of different dates to rains and high humidity; on the thinning, rate of growth, ripening, etc., of dates; on the pollination of pecans; on the causes of the failure of pecan nuts to properly fill; and on the flowering and fruit characters of 713 second-generation Deglet Noor date seedlings.

[Horticulture at the Michigan Station] (*Michigan Sta. Bien. Rpt. 1931–32, pp. 21, 43*).—The results are briefly discussed of studies on the development of

a wax spray for nursery stock and of a new seedling peach designated as Halehaven.

[Horticulture at the Montana Station] (*Montana Sta. Rpt. 1931, pp. 25–27, 30–34, 70–74, 89, 90, 97, figs. 2*).—Included in this progress report are the results of studies of the effect of fertilizers on the growth, yield, fruit quality, and fruiting habit of McIntosh apples; of winter protection for the Latham raspberry; of transplanting and succession plantings with cabbage; of the control of premature seeding in celery; of cultural and fertilizer experiments with lettuce; of cultural and training tests with tomatoes; and of the effects of phosphorus in hastening maturity of lettuce, squash, and cucumbers.

In addition information is presented on the results obtained at the substation at Corvallis of cover crop, cultural, irrigation, fertilizer, and pruning studies with apples; of varietal tests of raspberries and blackberries; and of pollination requirement and winter protection studies with the sour cherry. Judith Basin Substation trials with vegetables, fruits, and shelter belt trees and Northern Montana Substation tests of shelter belt trees are also summarized.

[Horticulture at the South Carolina Station], A. M. Musser, F. S. Andrews, R. A. McGinty, and L. E. Scott (*South Carolina Sta. Rpt. 1932, pp. 83–92, 126–128, fig. 1*).—In this progress report (E. S. R., 66, p. 633) brief statements are made of the results of studies of apple pollination and sterility; factors influencing the fruiting of Fordhook Lima beans; variations in seedling peach stocks and the resulting budded trees; asparagus fertilizer and spacing tests; the effect of source of seed upon the earliness and yield of tomatoes, melons, beans, and pop corn; and on variety tests of raspberries and dewberries.

Information is also presented on the results of studies at the Sandhill Substation on the fertilizer requirements of the peach, and on varietal trials with raspberries, dewberries, cantaloupes, and watermelons.

[Horticulture at the Washington Station], E. L. Overholser, F. L. Overley, O. M. Morris, L. L. Claypool, K. A. McKenzie, C. D. Schwartze, C. L. Vincent, C. A. Larson, and D. J. Crowley (*Washington Col. Sta. Bul. 275 (1932), pp. 40–45, 46, 58–62, 63, 67*).—The results are briefly discussed of studies of the effect of soil treatment in orchards on the penetration of winter cold; on the asexual propagation of apple stocks; on the value of sweetclover, red clover, and alfalfa as orchard cover crops; on orchard fertilizer investigations, including the effect of fertilizer on the keeping quality of apples; the effect of oil sprays on apple trees; on the removal of arsenical residue from apples; on peach harvesting and storage; on sweet cherry and apple pollination; on the control of little leaf of fruit trees; and on the breeding of red raspberries, strawberries, and tomatoes.

In addition there are included reports on studies at the Irrigation Substation at Prosser on orchard irrigation and fertilization; apple pruning; little leaf of fruit trees; the relation of leaf area to set, size, and composition of cherries and peaches; on fruit varieties; and on fertilizers for lettuce. Blueberry propagation work at the Cranberry Substation at Longbeach is also discussed.

[Horticulture at the West Virginia Station] (*West Virginia Sta. Bul. 254 (1932), pp. 6, 23, 44–47, 48–50, figs. 2*).—In conformity with earlier reports (E. S. R., 66, p. 537) brief statements are presented on the progress of various investigations, such as the breeding of watermelons resistant to wilt; the relation of certain groups of nutrients such as carbohydrates and nitrogen to pruning, bud formation, and fruiting; the pollination requirements of apple varieties; the effect of nitrogen fertilizers and the stage of picking maturity on keeping qualities of apples; the use of shredded oiled paper in apple

storage; the effect of nitrogen sources on apple yields; cover crops for apples; the influence of cultural practices on hardiness of peach buds; the relation of pruning to growth and yield in cherries; varietal trials with vegetables; the value of paper mulch in vegetable culture; and the use of deep tillage and dynamiting in loosening the subsoils in orchards.

Experimental work on electrically heated hotbeds, T. M. Currence (*Minn. Hort., 61 (1933), No. 1, p. 3, fig. 1*).—A brief account is given of a preliminary study at the Minnesota Experiment Station in which electrically heated, lead-covered cables were compared with electric lamps as a source of heat for young vegetable plants growing in outdoor frames well banked with straw. Dividing the total amount of current used by the average weight of plants, it was found that the lights were the more effective media.

Asparagus ([*Gt. Brit.*] *Min. Agr. and Fisheries Bul. 60 (1932), pp. V+51, pls. 6, figs. 9*).—General information is presented on varieties, selection, breeding, general culture, etc.

Studies in Indian Brassicae.—I, Sterility and selective pollen tube growth, A. R. Akhtar (*Indian Jour. Agr. Sci., 2 (1932), No. 3, pp. 280–292, pl. 1, figs. 2*).—In none of nine distinct morphological groups of Brassica under study was there found any evidence of defective pollen, but in one group there was observed defectiveness in the ovules. Some of the groups were distinctly self-compatible and others self-incompatible. Sterility in incompatible matings was due to a failure of the pollen tube to reach the ovule before it lost its receptiveness. In self-compatible varieties the offspring of self-fertilized seeds was vigorous and fertile, but in self-incompatible kinds the offspring of self-fertilized seeds made poor growth.

Mushroom growing in the United States, E. B. Lambert (*U. S. Dept. Agr. Circ. 251 (1932), pp. 35, figs. 18*).—General information is presented on the status of the industry, forcing structures, preparation of spawn, culture, control of insect and fungi pests, and harvesting and marketing. As determined in test tube trials, mycelium grew most vigorously in compost at a temperature of about 75° F. The entomological information is supplied by O. E. Gahm.

[New fruits and flowers], N. E. Hansen (*South Dakota Sta. Rpt. 1932, pp. 21, 22*).—Brief descriptions are presented of several fruits and one rose originated at the station. Of these, the Kola crab apple is said to be the only known tetraploid among named varieties of apples.

The leaf relations of fruit trees.—I, A morphological analysis of the distribution of leaf surface on two nine-year-old apple trees (Laxton Superb), M. C. Vyvyan and H. Evans (*Jour. Pomol. and Hort. Sci., 10 (1932), No. 4, pp. 228–270, pl. 1, figs. 17*).—Using two trees, one on the dwarfing stock Malling IX, fruiting heavily, and the other on the vigorous stock Malling V, bearing lightly, measurements were made of all the leaves on each tree. Growths were divided into primary spurs which had or had not bloomed, primary long shoots, and secondary shoots, and their foliage was analyzed with respect to size, position, etc. On both trees leaf size varied with the type of growth and the number and position of leaves on the growths. For example, a long shoot carried its largest leaves near the apex and the base.

The mean length of stem, the mean internodal length, and the mean and total leaf areas were greater and the leaf area per unit length of stem was less on the more vigorous trees. An examination of the surviving stems of past years' growth revealed a regular alternation in the relative amount of primary and secondary stems on the fruiting tree which apparently was associated directly with the recorded fruiting and blossoming performance of that tree.

Root studies.—II, The root development of an apple tree in a wet clay soil, W. S. Rogers (*Jour. Pomol. and Hort. Sci., 10 (1932), No. 4, pp. 219–227, pls. 3, fig. 1*).—In this second paper of a series (E. S. R., 63, p. 832), an account is given of the root development of one of a group of 26-year-old Bramley Seedling apple trees found growing thriftily in a soil supporting a growth of rushes and in which free water occurred at a depth of 90 to 100 cm. The bulk of the roots were found in the stiff clay between 50 and 90 cm deep, with branches extending upward to the surface and downward to a maximum depth of 127 cm. The roots extended farther from the trunk than did the branches, and in some cases interlaced with those of adjacent trees planted 37 ft. distant.

The Northern Spy apple a parent in breeding, W. T. Macoun (*Canad. Hort., 56 (1933), No. 1, pp. 10, 11*).—Presenting a summary of results secured at the Central Experimental Farm, Ottawa, at the New York Experiment Station at Geneva, and elsewhere, the author concludes that controlled crossing experiments have not shown strongly in favor of Northern Spy as a parent. Favorable results from open pollination are believed to indicate that there are desirable parental combinations for Northern Spy, or else self-pollination occurs. Data at Ottawa on 148 seedlings resulting from open pollination of Northern Spy showed an average of 11.63 years to be required for the beginning of bearing, with a range of from 8 to 17 years. None of 136 of these seedlings was poor or below medium in quality. Tabulation is presented of all Northern Spy crosses made at the Central Experimental Farm.

The colouring of apples after gathering, H. Goude (*Jour. Min. Agr. [Gt. Brit.], 39 (1933), No. 10, pp. 904–906, pl. 1*).—At the Burlingham Horticultural Station, England, apples deficient in color at the time of harvesting were greatly improved in this respect by exposure in shallow trays for a period of 10 days to daylight. During the process the fruits were sprayed at intervals with water to keep them from drying and shriveling. The treated fruits kept longer than those stored directly after picking. Apples with greasy skins failed to respond to the treatment, which is popularly known as sun dewing.

The influence of limb bending on the earliness and productivity of various pears [trans. title], E. Zanini (*Ann. Tec. Agr., 5 (1932), No. 5–6, I, pp. 575–599, pls. 14*).—Observations on several varieties of pears grown by a new cordon system of training, which permitted an upright trunk and reflexed branches, showed a profound influence on fruiting habit. The Beurre Clairgeau, for example, produced some fruit the first year after planting and was in full production by the third or fourth season. The lower production per tree was largely compensated by the greater number of trees per unit area.

Cherry studies, 1930–1932 [trans. title], H. Faes and P. Aubert (*Ann. Agr. Suisse, 33 (1932), No. 5, pp. 367–425, figs. 11*).—This, the fourth paper (E. S. R., 65, p. 230) in a series dealing with Swiss fruits, presents descriptions of a large number of sweet and sour cherries and classifies them according to their adaptation to various altitudes.

Experiments in cherry pollination, O. Einset (*New York State Sta. Bul. 617 (1932), pp. 13*).—Of 26 sweet cherries tested over a period of several years, none was found self-fruitful, although an occasional fruit was obtained in certain varieties. Sweet cherry pollen proved best for sweet cherry flowers, with sour cherry pollen giving fair sets and Duke pollen intermediate. Because of a difference in time of blooming sour cherries are little adapted for pollinating sweet cherries. Early Richmond, Montmorency, and English Morello proved fully self-fruitful, and as a group the sour cherries were equally well pollinated by sour and sweet varieties. None of the Duke cherries tested proved effective pollinizers for sour, sweet, or Duke varieties.

Studies of growth and fruit bud formation.—III, A year's observations on Victorian plums, C. Barnard and F. M. Read (*Jour. Dept. Agr. Victoria, 31 (1933), No. 1, pp. 37–44, figs. 4*).—Continuing the series (E. S. R., 68, p. 331), flower bud differentiation in the Grand Duke and Agen plums was first evident toward the end of December and in Satsuma about the middle of February. Axillary buds observed in the Agen and Satsuma varieties were nearly a month later than spur buds in showing primordia. A fairly consistent relationship was noted between the time of blossom bud initiation and the cessation of shoot growth.

Facts about 36 varieties of peaches, M. A. Blake (*New Jersey Stas. Circ. 262 (1932), pp. 4*).—Information is presented, largely in tabulated form, accompanied by brief descriptions and commentary notes.

Parthenocarpy and seedlessness in Vitis vinifera, H. M. Pearson (*Science, 76 (1932), No. 1982, p. 594*).—In studies by the California Experiment Station at Davis, it was found that a high percentage of Sultanina embryo sacs are perfectly normal at anthesis and are fertilized normally. In fact, Sultanina seeds frequently developed some endosperm tissue, and embryos of over 100 cells were observed. In this variety the author believes that at least one normal embryo sac develops and is fertilized in each normal berry. On the other hand in the Black Corinth all four embryo sacs were ordinarily in various stages of disintegration at the time of anthesis, and the polar nuclei very rarely fused.

Grape breeding in southern Morava (Moravia) [trans. title], A. Stummer and F. Frimmel (*Sborn. Výzkumn. Úst. Zeměděl. Repub. Československ. (Rec. Trav. Insts. Rech. Agron. Répub. Tchécoslov.), 94 (1932), pp. 71, pls. 5, figs. 14*).—Discussing the technic of grape breeding and the results secured during the decade 1922–1931, the authors report berry sets averaging scarcely 10 per cent of the pollinated blooms, with only one-fifth of the resulting seeds developing into plants. The respective germinations of seed from cross- and self-pollinations were 38.4 and 21.1 per cent, and the percentage of seedlings surviving the first year were 81.6 and 71.4 for the two groups. With respect to vigor, 64 per cent of the crossed seedlings rated strong as compared with 32 per cent for the selfs. Some 7,000 grafts made between two varieties of sharply contrasting characters failed to yield a single graft hybrid. Certain instances of mutations were noted, particularly with regard to color or size of the berries.

The vegetative propagation of cacao—I, A survey of possibilities, E. E. Pyke ([*Imp. Col. Trop. Agr., Trinidad*], *Cacao Res. Ann. Rpt., 1 (1931), pp. 4–9, pl. 1, figs. 4*).—Of various forms of asexual propagation tested, namely, hardwood and softwood stem cuttings, root cuttings, stools, and layers, the softwood cuttings, stools, and layers were sufficiently successful to justify further trials.

The genetic constitution of the cacao crop, F. J. Pound ([*Imp. Col. Trop. Agr., Trinidad*], *Cacao Res. Ann. Rpt., 1 (1931), pp. 10–24, figs. 6*).—In an attempt to estimate the statistical variability exhibited by the Trinidad cacao crop, believed to contain every possible combination of characters, complete records were taken on the crop of 300 trees from three different estates. Data were recorded on the number, weight, length, and diameter of pods, thickness of pod shell, and weight and number of beans per pod. The variation between pods of a single tree was large, but a random sample of 30 pods proved sufficient to characterize the tree. Seasonal variability was also large, with indications, however, that samples taken at the time of maximum bearing were close to the means of the whole crop. Seasonal variation was manifested in a progressive reduction during the dry period in all dimensions, accompanied by a slight change in shape.

The number of beans varied markedly from pod to pod, but the number of ovules was found very constant from ovary to ovary on any one tree. The number of ovules failing to mature into seeds was frequently in the vicinity of 25 per cent and sometimes nearly 50 per cent. The fact that loss of ovules varied from pod to pod indicated that purely genetic factors were not entirely responsible. On the other hand, significant differences in the percentage loss between classes of pods grouped according to shape strongly suggested genetic factors, as differences in shape were themselves largely the expression of differences in ancestry.

Studies of fruitfulness in cacao, I, II, F. J. POUND (*[Imp. Col. Trop. Agr., Trinidad], Cacao Res. Ann. Rpt., 1 (1931), pp. 24–28, figs. 3*).—These studies are presented in two parts.

I. *A note on the abscission of the flower* (pp. 24, 25).—An anatomical study of the pedicel suggested that flower abscission observed to occur freely during dry seasons, particularly in May, takes place at the constricted region, apparently by an osmotic mechanism. It is deemed likely that the generally high concentration of osmotically active materials in May would tend to cause flowers to drop early, or that the osmotic concentration of materials in the stylar tissues may not be favorable to pollen tube growth.

II. *Evidence for partial sterility* (pp. 26–28).—Asserting that the wilting and subsequent loss of young fruits is a serious problem in cacao production, the author presents the results of a study of possible causal factors. An average of 39.1 ovules in wilting and 38.8 ovules in sound fruits indicated that inadequate pollination was not a factor. Of eight clons tested, three were distinctly self-incompatible. Cross-pollinations revealed only one case of incompatibility, which occurred in only one direction. Indications were noted of a correlation between the initial rate of growth of the pistil and the number of successful pollinations.

The vegetative propagation of citrus, R. E. HUNTER (*Trop. Agr. [Trinidad], 9 (1932), No. 5, pp. 135–140, pls. 2*).—Results of preliminary experiments at the Imperial College of Tropical Agriculture, Trinidad, with various forms of citrus indicated that the relative speed of root formation differs with the species, and that the rate of formation was approximately the same irrespective of the methods employed. Due to the failure of hardwood cuttings to callus at the basal ends, except under very favorably controlled conditions, semihardwood cuttings were found much more desirable.

Investigations on the standardization of citrus trees by propagation methods (*Imp. Bur. Fruit Prod. [East Malling, Kent], Tech. Commun. 3 (1932), pp. 43, pl. 1*).—This is a summary of the results of experimental work in various parts of the world.

Results from experiments in California on citrus rootstocks, H. J. WEBBER (*Citrus Leaves, 12 (1932), No. 11, pp. 1, 2, 13, 14, 18*).—The material herein presented was largely covered in an earlier paper (E. S. R., 68, p. 51).

The continuity of high and low yielding tendencies in citrus trees, H. C. POWELL (*Jour. Pomol. and Hort. Sci., 10 (1932), No. 4, pp. 295–300, fig. 1*).—Individual tree records taken on fertilizer plats in a Marsh grapefruit grove in South Africa showed that trees which were low or high yielders during the four years preceding the application of differential fertilizer treatments maintained their respective positions during the two subsequent years. Data taken over a 3-year period in a young Washington Navel orange grove showed the trees to maintain closely their relative yielding position. Alternate bearing was not a problem in either orchard.

The lime in California, H. J. Webber (*Calif. Citrogr., 17 (1932), No. 12, pp. 456, 457, 478, 479, figs. 6; 18 (1932), No. 1, pp. 19, 32, figs. 2*).—This is a discussion of the early history, composition and uses, propagation, climatic requirements, varieties, general culture, etc., of the lime. Data presented on the comparative growth of the Mexican lime on four rootstocks, namely, sour, sweet, and trifoliate oranges and the rough lemon, showed the best growth on sweet orange and rough lemon, the results on these two being almost identical.

Performance of girdled and not girdled navel orange trees, A. D. Shamel and C. S. Pomeroy (*Calif. Citrogr., 18 (1932), No. 2, pp. 38, 62*).—Yield records taken at Corona, Calif., by the U. S. Department of Agriculture on Washington Navel orange trees planted in 1903 and girdled beginning in 1928 at the height of the blooming season by drawing a knife blade entirely around the trunk showed but little response to the treatment except in 1930, a year of rather light bloom. A marked reduction in yield as compared with untreated trees occurred the season after girdling was omitted. Little difference was recorded in the commercial grades and sizes of fruit from girdled and nongirdled trees.

Records for 1932 of pruned and not-pruned navel orange trees, A. D. Shamel and C. S. Pomeroy (*Calif. Citrogr., 18 (1933), No. 3, p. 68*).—The average yields in 1932 of 55 pruned and 54 unpruned Washington Navel orange trees were, respectively, 7.92 and 8.75 boxes of fruit. Observation of the fruit showed no significant effect of pruning on size or grade, thus confirming earlier conclusions (E. S. R., 65, p. 640).

Floral morphology of the mango (Mangifera indica Linn.) with special reference to the Pico variety from the Philippines, J. B. Juliano and N. L. Cuevas (*Philippine Agr., 21 (1932), No. 7, pp. 449–472, figs. 60*).—The results are presented of a study of the organography of the flowers and of the development of the gametophytes and pericarp of the fruit.

Chestnut culture in upper Italy and southern Switzerland, H. Kæser (*Die Kastanienkultur und Ihre Terminologie in Oberitalien und in der Südschweiz. Diss., Univ. Zürich, 1932, pp. 168, pls. 11, figs. 4*).—Presenting a description of the environment and conditions under which chestnuts grow in this region, the methods of harvesting, drying, and utilization are detailed.

Propagation of pecans, J. E. Bailey and J. G. Woodroof (*Georgia Sta. Bul. 172 (1932), pp. 22, figs. 12*).—In connection with a general discussion of budding, grafting, selection and care of scions, waxes, tools, etc., the authors report that nuts held through the winter buried in the soil germinated most readily and gave the highest percentage germination and the most vigorous seedlings. The second best results were secured with nuts stored at temperatures just above freezing in a saturated atmosphere. Drying or heating nuts at any time prior to planting was detrimental in proportion to the intensity or duration of the treatment. Large quantities of fertilizer applied in the drill with nuts decreased germination and in some cases reduced the size of plants. With respect to soil acidity, the highest germination in the Stuart and Rome varieties was obtained in a soil of pH 6.8. There was, however, quite a wide pH range (6.4 to 8.6) in which germination and growth proceeded favorably. Of various treatments used to hasten germination, brief exposures to a solution of ammonium hydroxide, ammonia fumes, and concentrated sodium hydroxide alone increased germinations above the controls. Nuts planted at a depth of about four times their diameter gave the best results. The position of the nut in the soil had little influence. Poorly filled nuts germinated as well as well filled nuts, but the growth of the resulting seedlings was inferior.

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The book of trees, A. C. HOTTES (*New York: A. T. De La Mare, 1932, pp. VIII+440, figs. 178*).—A popular treatise designed for the gardener and tree lover. Considerable space is devoted to the description of species, with general information on planting and care.

Insects and diseases of ornamental trees and shrubs, E. P. FELT and W. H. RANKIN (*New York: Macmillan Co., 1932, pp. XIX+507, figs. 243*).—A general discussion of numerous pests of trees and shrubs, particularly with reference to their control.

FORESTRY

[Forestry studies at the Michigan Station] (*Michigan Sta. Bien. Rpt. 1931–32, pp. 40, 41*).—Brief comments are made on findings as to the relation of forest growth to soil types and the use of improvement cuttings to increase the proportion of desirable species.

[Forestry at the South Carolina Station], E. D. KYZER (*South Carolina Sta. Rpt. 1932, p. 105*).—Brief reports are made of studies at the Coast Substation upon the effect of annual burning on longleaf pine reproduction and upon ways and means of maintaining fire lines.

Binocular telescopes in forest fire detection, J. R. CURRY (*Jour. Forestry, 31 (1933), No. 1, pp. 51–58, fig. 1*).—The author concludes that binoculars have distinct value at forest fire lookout stations. The prismatic type is regarded as best adapted to fire-detection work, and should be of six or seven magnifications with a wide field, high illumination, and excellent resolving power.

Visibility maps constructed with the slide-rule, R. STAHELIN (*Jour. Forestry, 30 (1932), No. 8, pp. 983–987, figs. 2*).—A description is given of a method for determining the limits of visibility from a mountain lookout by means of a standard slide rule used in connection with a topographic map.

Growing trees in northeastern Wyoming, P. K. THOMPSON (*Wyoming Sta. Bul. 192 (1932), pp. 12, figs. 4*).—A general discussion of planting, cultural care, pruning, etc., based on experiences at the Campbell County State Experiment Farm near Gillette where the average annual rainfall is approximately 15.7 in. and the average frost free period 113 days. Among trees displaying marked hardiness and other desirable features are Chinese elm, Russian-olive, Caragana, northwest poplar, boxelder, and green ash.

[Tree testing in Wyoming] (*Wyoming Sta. Rpt. 1932, pp. 34, 36*).—Brief reports are presented on the results of hardiness tests with windbreak trees at the Eden Substation and of tests of seedling apples at the Lander Substation.

Seed source and quality, G. S. PERRY and C. A. COOVER (*Jour. Forestry, 31 (1933), No. 1, pp. 19–25*).—An extensive study at the Forest Research Institute, Mont Alto, Pa., led to the conclusion that the size of fruits of shortleaf pine, pitch pine, tulip poplar, and white ash is a poor index to quality but that the weight is roughly proportional to germinative energy and seedling vigor. In the conifers, trees which matured and scattered their seed early produced heavy seed but also an inordinately large number of hollow seed. Seeds taken from precocious cones germinated more quickly than the average. The location on the tree had little effect on the quality of the seed, although that from the top third of the crown showed some indications of superiority.

Site prediction in virgin forests of southeastern Alaska, R. F. TAYLOR (*Jour. Forestry, 31 (1933), No. 1, pp. 14–18*).—The cutting of the climax forest made up of approximately 74 per cent western hemlock and 20 per cent Sitka spruce and the consequent increase in light and soil moisture hastened decomposition of the acid litter and provided a more favorable environment for spruce development. As a result, the second growth stands frequently contained double

the percentage of spruce found in the climax association. In the course of time, after the new stand closes, the site conditions again favor hemlock and this species increases.

The author believes that if stands were cut somewhere between 75 and 150 years of age the climatic climax would not again be reached. Due to a thinner podsol layer and a higher percentage of spruce available for seed trees, the opening up of the younger forest should afford more favorable seedling conditions than does the removal of the climax forest.

Notes on Arizona pine and Apache pine, A. D. READ (*Jour. Forestry, 30 (1932), No. 8, pp. 1013, 1014*).—In connection with descriptions of the outstanding characteristics of *Pinus arizonica* and *P. apacheca*, data are presented on the net weight of seed per bushel of cones, the number of seeds per pound, the degrees of temperature necessary for opening the cones, etc.

The roots of a jack pine tree, E. G. CHEYNEY (*Jour. Forestry, 30 (1932), No. 8, pp. 929–932, figs. 2*).—A study by the Minnesota Experiment Station of the roots of a jack pine 10 in. in diameter at breast height, 45 ft. tall, and growing in a medium dense stand located some 15 ft. above a neighboring swamp indicated that the jack pine draws the great bulk of its nutrients and moisture from the upper foot of soil. The direction of the horizontal roots did not appear to be influenced by the presence of other roots unless in actual contact. Only one case of root grafting was observed.

Thinning jack pine in the Nebraska sand hills, J. ROESER, JR. (*Jour. Forestry, 30 (1932), No. 8, pp. 918–924*).—Remeasurements in 1926 of jack pines planted in the Nebraska National Forest in 1911 and thinned in part in 1920 and in part in 1923 indicated that the rate of diameter accretion, and to a much less degree the rate of height growth, increases in direct ratio with the wider spacing between trees. Subsequent measurements in 1931 showed the greatest diameter increment in the most severely thinned plats, whereas after thinning the heavily thinned plats with 696 trees per acre had only 38 per cent the volume of the nonthinned stand, 2,098 trees per acre. Nine years later the volume had reached 91 per cent, with prospects that within two more years the volume of the heavily thinned plat would surpass the unthinned.

Interpreted practically, a stand heavily thinned when from 10 to 12 years old should produce a stand of 6- to 7-in. fence posts in 27 years, or about 14 years sooner than such trees could be expected on an unthinned area.

The development of seedlings of ponderosa pine in relation to soil types, J. HOWELL, JR. (*Jour. Forestry, 30 (1932), No. 8, pp. 944–947*).—Ponderosa pine seedlings grown in the greenhouse in eight soils, ranging from light pumice to gravelly clay, made their greatest growth in the pumice, indicating a preference for loosely combined soils. The greatest number of lateral roots occurred in the pumice and sands.

A survival table for even-aged stands of northern white pine, J. L. DEEN (*Jour. Forestry, 31 (1933), No. 1, pp. 42–44*).—From data obtained in permanent sample plats of natural, even aged stands of northern white pine located in Massachusetts and New Hampshire the author has prepared a survival table designed for use in predicting yields.

Some diameter distributions in forest stands of northwestern Pennsylvania, A. F. HOUGH (*Jour. Forestry, 30 (1932), No. 8, pp. 933–943, figs. 6*).—Studies in second growth, virgin stands, and old stumps of former stands of white pine in northwestern Pennsylvania led to the observation that white pine in this locality is even aged in second growth stands and essentially so in virgin stands. The stand graph of even aged white pine strongly resembled the curve of normal frequency, even in stands that were neither overstocked nor pure. Old white pine stumps from virgin stands logged from 60 to 80 years

ago showed diameter distribution similar to that observed for second growth, suggesting that this old growth also originated in even aged stands.

The portable band sawmill and selective logging in the loblolly pine forests of North Carolina, R. D. GARVER and J. B. CUNO (*U. S. Dept. Agr., Tech. Bul. 337 (1932), pp. 30, figs. 4*).—Information is presented by diameter classes on the relative production cost and lumber grades and yields obtained when old-field second-growth loblolly pine was cut by a new type of portable band sawmill. Trees below 11 in. in diameter were not profitable when cut into lumber, not including the cost of stumpage, Federal taxes, or interest. With these items included, trees would have to be at least 13 in. in diameter to be profitable. The greatest gross return came with the least volume, that is, a 14-in. cutting limit removed 54 per cent of the volume and yielded 76 per cent of the maximum possible return. Where hardwoods were present they were cut along with the pine, but at a distinct loss.

Portable sawmills turned out well manufactured lumber and produced more lumber from logs of a given size than did a large band sawmill in the same locality. Edging and trimming of lumber after it passed through the kiln was successfully accomplished. Selective logging proved a satisfactory economic method of handling old-field stands of pine in the coastal plains area.

Volume tables for Mississippi bottomland hardwoods and southern pines, J. W. GIRARD (*Jour. Forestry, 31 (1933), No. 1, pp. 34–41, fig. 1*).—Volume tables are presented for red gum, red oak, loblolly pine, longleaf pine, and shortleaf pine.

Further notes on water-content of trees, on the results of girdling and on certain seasoning and flotation experiments, with reference to the sinkage problem, R. D. GIBBS ([*Montreal*]*: Canad. Pulp and Paper Assoc., Woodlands Sect.*, [*1932*], *pp. 7, figs. 5*).—As reported by McGill University, moisture determinations of wood taken from living trees showed no summer decrease in softwoods, such as jack pine, spruce, and balsam, but very substantial declines in birch and poplar. Eighty-year-old birch trees girdled in February lived through the two subsequent growing seasons, and the water content of the wood of these trees was practically the same as that of untreated trees. The drying effect of bark removal was shown in the case of 4-ft. birch bolts cut in June and piled on skids. In October these peeled logs had 44 per cent water and the unpeeled 79 per cent.

Observations on logs floating in a quiet lake showed very little top drying in those portions that were above the water line; in fact about 30 per cent of the logs had turned to some extent in the water.

DISEASES OF PLANTS

Plant pathology, J. G. BROWN (*Arizona Sta. Rpt. 1932, pp. 109–117, 118–125, figs. 18*).—Results are reported of studies of bacterial rot of lettuce; Texas root rot of cotton; galls on *Cupressus arizonica;* Graphiola leaf spot of the date palm; foot rot of peas; Cytospora canker of weeping willow, walnut, and pecan trees; virus diseases of potato; and wilt resistance in watermelons.

[Plant disease studies at the Michigan Station] (*Michigan Sta. Bien. Rpt. 1931–32, pp. 18, 19, 20*).—Notes are given of findings as regards scab and yellow dwarf of potatoes, yellows of celery, injury to roadside trees by calcium chloride, and cytological studies of orange rust of Rubus.

Controlling plant diseases (*Montana Sta. Rpt. 1931, pp. 40–42, fig. 1*).—Results are briefly noted of studies of mosaic and other virus diseases of potatoes and beans, as well as of smut in wheat.

[Plant disease studies of the Washington Station], F. D. Heald, E. F. Gaines, L. K. Jones, G. Burnett, E. J. Anderson, G. A. Huber, and D. J. Crowley (*Washington Col. Sta. Bul. 275 (1932), pp. 46–49, 66*).—Data are reported as to findings on wheat smut, raspberry mosaic, virus diseases of potato, Verticillium wilt of chrysanthemum, downy mildew of pea, damage to cranberry bogs by *Sclerotinia oxycocci*, and deterioration of alfalfa fields, as well as notes from the plant disease survey.

[Plant disease studies in West Virginia] (*West Virginia Sta. Bul. 254 (1932), pp. 50–54, fig. 1*).—Studies are reported of the watermelon wilt fungus *Fusarium niveum*, fungicides for apple disease control, apple fruit spots, apple measles, collar rot of apple trees, apple rust, black walnut canker, frog-eye leaf spot of apple, inactivants for the virus of tobacco mosaic, and variations in susceptibility of vegetables to *Bacillus carotovorus*.

Diseases of plants, M. Mitra (*Imp. Inst. Agr. Res., Pusa, Sci. Rpts. 1929–30, pp. 58–70*).—In this part of the report of the Imperial mycologist, information is furnished regarding rahar (*Cajanus indicus*) wilt (*Fusarium vasinfectum* and *Rhizoctonia solani*), sterility (virus?), and leaf spot (*Cercospora* sp.); sugarcane mosaic, top rot (*?Fusarium* sp.), and downy mildew (*Sclerospora* sp.); *Piper betle* wilts (*R. solani, Sclerotium rolfsii*, and *Phytophthora* sp.); Cinchona diseases (*Diplodia* sp., *Fusarium* sp., *Verticillium* sp., *Nectria* sp., and *Botryodiplodia* sp. isolated); gram leaf blight (*Mystrosporium* sp.), wilt (*Fusarium* sp.), and *R. solani;* potato wet rot, Fusarium rot, and *R. bataticola;* maize cob rot (*B. theobromae*); wheat bunt (*Tilletia indica* n. sp.), leaf spot (*Helminthosporium sativum*), and other forms; barley disease (*H. sativum*, saltant?); *Panicum frumentaceum* disease (*H. frumentacei* n. sp.); rice disease (*H. oryzae, saltant*); sugarcane eyespot (*H. sacchari*, saltant); jowar (*Sorghum vulgare*) disease (*H. turcicum* and *H. maydis*); ginger disease (*H. maydis*); *Eleusine* spp. disease (*H. nodulosum* (the most virulent), *H. leucostylum, H. tetramera*, and *Helminthosporium* sp.); and *Hibiscus sabdariffa* bud and shoot infection (*Acrothecium lunatum* and *Helminthosporium tetramera*?).

Mycological notes, J. C. F. H[opkins] (*Rhodesia Agr. Jour., 26 (1929), No. 8, pp. 793–797*).—Methods are detailed of seed treatment for maize against Diplodia seedling blight and ear-rotting fungi and of seed treatment for tobacco against bacterial diseases.

Cytological studies on plant resistance to disease [trans. title], J. Dufrénoy (In *Problèmes Agricoles. Paris: Inst. Natl. Agron., 1929, No. 2, pp. 195–207, figs. 12*).—The author deals with the subjects of local immunity, as related to hyperactivity of disease-infected cells, the production locally of more or less strongly disinfecting compounds in cells adjacent to those attacked, and the formation of callosities; and general resistance of the plant to disease in such matters as relate to upset of metabolism, chlorosis, stunting, and withering.

Studies on the rôle of the host in the genus Diaporthe, L. E. Wehmeyer (*Mich. Acad. Sci., Arts, and Letters, Papers, 11 (1929), pp. 309–328, pls. 3*).—In a study regarding the rôle of the host, the fungi *D. acerina, D. dubia, D. celastrina, D. woolworthi, D. beckhausii, D. tuberculosa*, and *D. virburni spiraeicola* n. v., were obtained in single spore cultures. All produced pycnidia of the Phomopsis type with both alpha and beta conidia. They were cultivated saprophytically on various host twigs to determine the influence of the host on the variation of morphological characters.

Stromatic characters proved quite variable in some species, more or less constant in others. The conidial range in variation in size and shape proved constant on the various hosts and often typical of the species.

Morphological differences in both the perithecial and conidial stage were often clearly correlated with a host genus or species, this fact indicating fungus species narrowly limited as to host.

New methods for the diagnosis of species of the genus Fusarium, G. H. Coons and M. C. Strong (*Mich. Acad. Sci., Arts, and Letters, Papers, 9 (1928), pp. 65–88, pl. 1*).—"Attempt has been made by the writers to employ serological technic which previously has been used in a few cases to diagnose bacterial species causing plant disease and also with some fungi. It was found possible to secure anaphylactic reactions with sensitized guinea pigs, but the method was not found applicable to the problem at hand. Complement fixation technic permitted the differentiation between closely related Fusaria. With either ground or mycelial mats or mats peptized by selenium oxychloride reacting sera were obtained. The method is believed to be too exacting to allow it to have any general applicability, but it may be of value in special investigations."

The ascigerous forms of some graminicolous species of Helminthosporium in Japan, S. Ito and K. Kuribayashi (*Jour. Faculty Agr., Hokkaido Imp. Univ., 29 (1931), No. 3, pp. 85–125, pls. 3*).—Though the genus Helminthosporium, including many economically important parasites, has been studied intensively by many workers from the pathological as well as from the mycological standpoint, the ascigerous forms have been reported for a comparatively small number of species. The authors have obtained new ascigerous forms of six species, all parasitic on important cereals.

This paper presents information on these, also on four others of which the perithecial stages were already known, with special notes on the history and taxonomy of these fungi in Japan and in addition to his personal observations.

Physiologic forms of barley mildew, Erysiphe graminis hordei Marchal, E. B. Mains and S. M. Dietz (*Phytopathology, 20 (1930), No. 3, pp. 229–239, figs. 3*).—In this joint contribution from the Indiana and Iowa Experiment Stations the race of powdery mildew (*E. graminis hordei*) on barley is said to embrace at least five physiologic forms, capable of being separated by the reaction of a selected set of varieties of barley resistant each to some of the forms and susceptible to others in the seedling stage in the greenhouse. Barley varieties resistant to these physiologic forms are known for all of the principal species, *Hordeum vulgare, H. intermedium, H. distichon,* and *H. deficiens.*

Of the 40 varieties which are discussed in the present paper, 3 proved very resistant and 13 others more or less resistant to all 5 of the physiologic forms. Five proved resistant to 4 forms and susceptible to 1. Eight proved resistant to 3 forms and susceptible to 2. Two were resistant to 2 forms and susceptible to 3. Five were resistant to 1 form and susceptible to 4. Four were susceptible to all 5 physiologic forms.

The varietal response and inheritance of resistance in barley to Erysiphe graminis hordei p. f. 4, S. M. Dietz (*Iowa State Col. Jour. Sci., 5 (1930), No. 1, pp. 25–33, pl. 1*).—*E. graminis hordei,* a destructive parasite on barley in most of the barley-growing sections of the United States, is favored by coolness and humidity. The losses are particularly severe in the southern part of the United States, where barley is planted in the fall. The eastern half of the Mississippi Valley and the coastal States of the West suffer losses annually.

In Iowa barley had suffered little from powdery mildew during the previous 12 years though severely attacked in the neighboring States, the reason for this not being known. In 1907, Biffen showed (E. S. R., 19, p. 44) that resistance to *E. graminis hordei* was an inheritable character in crosses of *Hordeum spontaneum* (resistant) on *H. hexasticofurcatum* (susceptible). As noted above Mains and Dietz isolated five physiological forms, the behavior of which

toward 40 varieties of barley is indicated. "Although the discovery of physiologic specialization complicates the production of a resistant variety of barley by hybridization, such an attempt is being made because of the economic importance of barley mildew." The present paper deals with the varietal response and inheritance of resistance to a single physiologic form. The work and its outcome are presented in compact detail.

When the responses of 90 pure line barley varieties to *E. graminis hordei* p. f. 4 were determined, the highly resistant varieties included only four, Goldfoil C. I. 928, Unnamed C. I. 96, Hanna C. I. 906, and Duplex C. I. 2433. For the rest, 44 proved very susceptible and 42 intermediate in reaction.

Susceptibility seems to be due to a single pair of factors, as shown by the close approximation to a 3:1 ratio in the F_2 and verified by the F_3 progeny tests.

Smut in oats: Dry pickling effective, W. B. Miller and J. A. Morrow (*Jour. Dept. Agr. Victoria, 29 (1931), No. 2, pp. 86–89, figs. 3*).—Experimentation at the Rutherglen Experiment Farm in 1929 and in 1930 with Algerian oats naturally infected with loose smut (*Ustilago avenae*) and with covered smut (*U. levis*) showed that it is not advisable (if available) to use oats for seed from a smut-infected crop. Infected or doubtful seed may be rendered reasonably safe by the use of the so-called dry pickle, copper carbonate, applied at the rate of 2 oz. per bushel. This is preferred to the wet pickle.

Though formalin gave a slightly better smut control than did the copper carbonate, this was more than offset by the distinct lowering of germination. Both years showed high smut infection, but smut reduction by copper carbonate was very satisfactory, from 32 to 3.8 per cent in 1929 and from 31.4 to 4 per cent in 1930. The dry-pickled seed ran easily from the drill, the swollen formalin-treated seed with some difficulty.

It is thought posible that, by using the dry pickle at higher rates per bushel, better control of oat smuts could be secured.

The control of loose smut in wheat, D. B. Adam and R. T. M. Prescott (*Jour. Dept. Agr. Victoria, 29 (1931), No. 3, pp. 141–145, fig. 1*).—Wheat loose smut (*Ustilago tritici*), present in all wheat-growing districts of Victoria, causes annual damage estimated at from 1 to 2 per cent of the crop. The Jensen hot water preventive method, though effective, is laborious and tedious, resulting in soft, swollen grain difficult to handle. A method which is described as an improved arrangement designed to apply the treatment credited to Tapke (E. S. R., 55, p. 45), is outlined.

It is claimed that where an infected seed sample is soaked in water maintained at 120° F. for 1 hour and 40 minutes the resulting crop produced subsequently will grow practically free from infection. This treatment depresses germinability increasingly with increased time of subjection, though the total of resulting crop yield is said not to be lessened.

Spraying carrots for control of leaf diseases, J. D. Wilson (*Ohio Sta. Bimo. Bul., 18 (1933), No. 1, pp. 2–4, fig. 1*).—Spraying with Bordeaux mixture had relatively little value for the early carrot crop in 1932 because of the prevailing dry weather which prevented the spread of the two leaf diseases *Cercospora apii carotae* and *Macrosporium carotae*, both of which are briefly described. Marked benefits were obtained in the case of a later-maturing crop which was sprayed four times from June 15 to July 15. Sprayed carrots yielded at the rate of 907 bu. per acre and the unsprayed 544 bu. The roots of the sprayed plants were more uniform and less sunburned at the crown.

"Pinking" of maize, T. K. Sansom (*Rhodesia Agr. Jour., 26 (1929), No. 9, pp. 917–926, pls. 2*).—The results of this preliminary investigation are said to indicate that pinking in maize, which is very prevalent in many parts of

Rhodesia and in the Union of South Africa, is hereditary in its character. This fact indicates seed selection as the best means of control.

Nematodes and cotton "soreshin," C. H. ARNDT and J. R. CHRISTIE (*South Carolina Sta. Rpt. 1932, pp. 50, 51, fig. 1*).—A report is given of studies in cooperation with the U. S. Department of Agriculture.

An epidemic occurrence of Ustilago comburens Ludwig on Danthonia pilosa R. Br., an unrecorded host for New Zealand, B. PARLANE (*New Zeal. Inst. Trans. and Proc., 60 (1929), pt. 2, pp. 253–258, figs. 5*).—In 1928, the occurrence was noted of the smut *U. comburens* on the grass *D. pilosa*. This grass grows widely in New Zealand chiefly on poor land in dry situations, where it forms an important pasture constituent, as also in Australia and Tasmania. An account is given of the smut fungus in view of its possible economic significance.

Potato spraying and dusting experiments, 1929 to 1931, R. BONDE (*Maine Sta. Bul. 362 (1932), pp. 177–232, pls. 4*).—Continued experiments (E. S. R., 62, p. 632) were made to gain information on the control of both late blight and early blight under farm conditions. Records from 1916 to 1931 indicated the average increase to be expected from spraying Green Mountains in Aroostook County approximates 29.5 bu., while the average yield for the period was 328 bu.

In 1929, with late blight practically absent, application of full strength Bordeaux mixture apparently decreased the yield, highest yields coming from unsprayed plats or those receiving one-half strength Bordeaux mixture. Copper-lime dust plats yielded the least. In 1930 and 1931, with late blight prevalent, the yield rate was increased significantly, about 75 bu. per acre, by spraying.

In 1930 plats sprayed with low and high pressures did not differ significantly in yield. A pressure of 230 to 300 lbs. per square inch was as effective as from 400 to 500 lbs. in increasing yield when applied with the same tractor-power machine. Yield was less with a wheel-traction machine, due to more vine injury by the wheels. The yield with the tractor-power machine was greater with instant Bordeaux than the standard Bordeaux. The several treatments gave similar disease control. Bordeaux mixture in reduced concentrations gave good disease control and yields in 1930, even when development of late blight was favored.

Copper-lime dust controlled disease better in 1930 when applied to wet foliage than to dry foliage. Dust by either method controlled late blight less effectively than Bordeaux mixture containing the same quantity of copper (25 lbs.), and dusted plats were inferior in yield. In 1931 copper-lime dust at 283 lbs. per acre for the season (25 lbs. of copper) did not control late blight as well as Bordeaux mixture, and the yield was correspondingly less. The standard Bordeaux applied with a wheel-traction machine controlled late blight slightly less effectively than Bordeaux applied with the tractor-power machine, and yield was reduced correspondingly, due to difference in disease control and in wheel injury caused by the two spray machines. Disease control and yield rate were similar with several types of Bordeaux. In a second series of plats, 199 lbs. of copper-lime dust (18 lbs. of copper) controlled late blight about as well applied to wet foliage as to dry foliage, and yields were similar, yet disease control was inferior to that with the application containing 25 lbs. of copper, but resulting in the same yield.

In the 8 years, 1922–1925 and 1928–1931, dusted plats averaged 8 bu. per acre less than Bordeaux mixture. While dust about equals Bordeaux mixture in increasing yields in years with a moderate amount of disease, in years of seri-

ous blight epidemics, as in 1930 and 1931, dust generally is less effective in disease control than spray, and the yields will be correspondingly less. The increased yield rates secured with instant Bordeaux in comparison with standard Bordeaux, and the greater ease of preparation would seem to outweigh the greater costs of materials on certain farms. Burgundy mixture (sal soda Bordeaux) showed certain merits and might be considered by some to replace Bordeaux mixture. Oxo Bordeaux, although containing much less copper, compared well with standard Bordeaux, and, like Burgundy mixture, left less residue to interfere with mosaic roguing. It gave good yields, but failed to give entirely satisfactory control of late blight. Bordeaux mixture made from stone lime was not significantly superior to that made with hydrated lime in tests in 1931.

Omitting the early summer applications and postponing the first spraying operations until blight was noted in the field did not affect yield, while in 1931 omission of the last applications resulted in a reduction of 86 bu. per acre in yield, or four-fifths as much loss as resulted from omitting all spraying, yield reduction in both cases being due to late blight. With mechanical injury absent, Bordeaux spraying reduced vine growth and yield rate until late August when late blight control became important. The immediate source of the first late blight infection seemed to be from the air in most fields. Diseased seed pieces should not be planted. In 1930 the rot due to late blight was evident in 8 per cent of the crop at digging, in certain places, but varied to smaller amounts with differences in soil type, slope, and drainage.

Disease surveys were made late in August in 1930 and 1931 in Aroostook County. Of 670 fields observed in 1930, 82.5 per cent were practically dead, and in 1931, 62 per cent of 640 fields noted were 80 per cent or more dead. Losses in commercial fields of this county were estimated at several million bushels each year. Inadequate control by growers seemed not due so much to the kind of equipment and material as to the ceasing of spraying too early in the season. The conclusion from the experiments and surveys was that late blight or rust can be controlled successfully even during periods of severe epidemics.

The anatomy of the overgrowth on sugar beets caused by Bacterium beticola, H. A. Elcock (*Mich. Acad. Sci., Arts, and Letters, Papers, 9 (1928), pp. 111–115, pl. 1*).—The galls formed in connection with *B. beticola* in what Smith et al. called tuberculosis of the sugar beet (E. S. R., 25, p. 243) are said to resemble tubercles formed in tuberculosis of animals, and to constitute in plants a tuberculous tissue. These tissues forming galls are of the type of hyperplasia as well as of hypertrophy, which fact explains the distinctive external appearances. In this type of gall, as distinguished from crown gall, tumor strands are not produced.

The bacteria in living tissues are distinctly intercellular, and form pockets, which may occur in beet tissue of any type. The organism may enter tracheids or tracheae from the colonies in the pockets. They may travel far in the transpiration stream, and cause gall formation at points far from their origin.

Control of beet nematodes (Heterodera schachtii) by use of physiological stimulants [trans. title], E. Molz (*Zentbl. Bakt. [etc.], 2. Abt., 81 (1930), No. 1–7, pp. 92–103, pls. 2*).—Early views as to the use of physiologically effective materials in connection with attempts at stimulational control of nematodes (*H. schachtii*) injuring sugar beets have been furnished by Müller and Molz (E. S. R., 33, p. 851). More recent research data are indicated with discussion.

Nematode-stimulating substances always proved to be oxidizers or oxidation promoters.

Relations are said to exist between substances stimulating nematodes and stimulants as used in human medicine. Thigmotaxis is highly developed in larvae of *H. schachtii.*

Chemotactically active substances, particularly calcium chloride, attract the larvae and fix them in a rigid reflex condition which eventuates in their death. The significance of such substances, which thus attract the larvae from their eggs or cysts, is supposedly considerable.

The utilization of varieties in the field control of sugar cane mosaic and root disease in Cuba.—A preliminary report, J. A. Faris (*Trop. Plant Res. Found.* [*Yonkers, N. Y.*] *Sci. Contrib. 20 (1931), pp. 69, figs. 2*).—The present widespread interest in cane varieties in Cuba is said to have had its beginning in attempted control of the so-called root rot diseases and of the cane mosaic disease. Work done in this direction is outlined summarily and separately for each of these troubles, including in a preliminary way studies carried out with the cooperation of officials representing 23 centrals. Some of this work has been noted (E. S. R., 59, p. 850; 60, p. 244; 64, pp. 235, 351), and related information is indicated.

As causal or contributary factors or conditions for root rot development, defective drainage, scant moisture, deficient cultivation, and low fertility have been found prominent. Sugarcane mosaic disease is a condition fundamentally different from the root disease complex, being an infectious disease, spread by an insect, the more readily and rapidly as the plants are healthy and vigorous in contrast to the conditions favoring root rot. Vigorous roguing enabled certain plantations to control mosaic easily, and planting of disease-free seed reduced the percentage to a negligible figure.

Frog eye disease of tobacco, J. C. F. Hopkins (*Rhodesia Agr. Jour., 26 (1929), No. 8, pp. 817–822, pl. 1*).—Tobacco frog-eye, a common leaf spot (*Cercospora nicotianae*) which may appear in seed beds or in fields and may eventuate in a serious black spotting in the barns, is often confused with angular leaf spot. It may be controlled by completely removing the spotted leaves in the first or second priming, reducing moisture in the barns, and spraying the seed beds.

Effects of tobacco mosaic upon the growth of Bacillus aroideae Townsend, the cause of tobacco hollow stalk [trans. title], H. Fukano (*Bul. Sci. Fakult. Terkult., Kjušu Imp. Univ., Fukuoka, Japan., 4 (1930), No. 1, pp. 45–51, figs. 2; Eng. abs., p. 51*).—Since mosaic is supposed to affect in characteristic ways any part of a plant except the seeds, the development of pathogenic organisms when present should presumably also be affected. *B. aroideae* was accordingly used to test for any such disease-retarding or disease-accelerating effect of mosaic in tobacco upon the advance of the introduced disease.

In Czapek's solution the filtrate of mosaic tobacco leaves accelerated the growth of the bacterial organism more strikingly than did that of nonmosaic tobacco leaves. Also, stems of mosaic tobacco allowed more rapid advance of the bacterial disease than did those of the healthy plant when inoculated with *B. aroideae.*

Leaf spotting of tobacco caused by mosaic, J. C. F. Hopkins (*Rhodesia Agr. Jour., 26 (1929), No. 9, pp. 912–916, pls. 2*).—Mosaic in tobacco, causing much depreciation of value in the cured leaf, owing to the increase of shorts, poorness of texture, spotting, and discoloration, is found in the seed beds, being supposedly introduced by the natives' use of snuff or nyoka tobacco. Control of the trouble depends on early and drastic action. Elimination of the diseased plants is the most dependable method.

Some detrimental effects of spraying tomatoes with Bordeaux mixture, J. D. Wilson and H. A. Runnels (*Ohio Sta. Bimo. Bul., 18 (1933), No. 1, pp. 4–15, figs. 3*).—Coleus and tomato plants grown in water-tight containers the soil of which was maintained at two different moisture levels showed an increased transpiration rate when sprayed with Bordeaux mixture and a decreased rate when sprayed with oil. At the lower soil moisture content (15 per cent on the basis of dry weight) growth was retarded markedly by the Bordeaux mixture. Slight marginal injury followed the use of both oil and Bordeaux mixture on both Coleus and tomato plants in the 15 per cent soil moisture lots.

During the dry summer of 1932 field-grown Bonny Best and Globe tomato plants sprayed with Bordeaux mixture were retarded in growth and in some instances injured. The authors believe the injury was accentuated by the low moisture content of the soil because after rains there was a marked recovery in the case of the Globe plants. Blossom-end rot was much more prevalent in the Bordeaux-sprayed plats than in the controls. On the other hand oil-sprayed plants were considerably less affected than were the controls by blossom-end rot. Oils did not materially affect either growth or yield, and it is conceded possible that in dry seasons oil sprays might be useful in decreasing blossom-end rot.

Leaf scorch of fruit trees, F. M. Read (*Jour. Dept. Agr. Victoria, 29 (1931), No. 8, pp. 386, 387, figs. 2*).—Admitting that some of the fruit tree leaf scorch recently appearing in Victoria may have been due, as has been alleged, to spray injury, the author points out the results of research tending to show that leaf scorch is particularly favored by soils which are very light and sandy and prone to dry out, soils which are shallow and situated above an impervious subsoil, or soils which are water-logged to the extent of restricting root growth. Any of these would result in a faulty water supply to the tree. The heavy leaching of potash from the tree in a wet year would accentuate the result and should be remedied by potash applications where necessary. In the case of rich soils high in nitrogen, it may be advisable to lower the supply by allowing heavy weed growth instead of practicing the usual clean cultivation.

Brown rot and transit rot and their control, S. Fish (*Jour. Dept. Agr. Victoria, 28 (1930), No. 1, pp. 33–43, figs. 7*).—This is a report on consignments of peaches sent from the Goulburn Valley to the Sydney market. Examinations at Sydney in 1928 of 39 consignments from this source showed damage in 34 of these, ranging from 20 to 100 per cent and due to transit rot (*Rhizopus nigricans*) or to brown rot (*Sclerotinia americana*), or to both. It is found that sound peaches may be held for three weeks in cold storage, but fruit showing such rots can not be profitably stored.

Tests developed fungus cultures from the following sources: The surface of a sound peach on the tree or of diseased fruit; dust in the picking bags, in the picking boxes, on the grader, from the lorries, or from railway trucks; the atmosphere of the packing shed or of the market; and new cases where stacked in contaminated sheds.

Information is supplied regarding such factors as fruit injury, weather (humidity or rainfall), dry air, and temperature. Precooling and icing in transit seemed to be the most hopeful factors.

Observations and experiments on the mulberry rust caused by Aecidium mori Barclay, M. Hiura (*Japan. Jour. Bot., 5 (1931), No. 3, pp. 253–272, pls. 3, figs. 3*).—Mulberry rust (*A. mori*), said to be found commonly throughout the mulberry-growing regions of Japan, is thought to cause considerable damage each year. In the vicinity of Gifu, where the primary infection appears late in

April, becomes prevalent late in May, and declines from mid-June onward, it has been thought to warrant the study here presented in detailed, tabular form.

The disease is transmitted from tree to tree by the aecidiospores, infection following inoculation after six or eight days and sporulation requiring about two weeks. The aecidial mycelium hibernates supposedly only within the basal tissues of the latent buds. All varieties tested appear susceptible, though in different degrees. Gradual development of immunity in leaves of susceptible plants has been demonstrated. The younger leaves are generally the more susceptible.

Blue and green moulds of oranges, G. B. TINDALE and S. FISH (*Jour. Dept. Agr. Victoria, 29 (1931), No. 2, pp. 101–104, figs. 2*).—Citrus fruit blue mold and green mold are spread through the activity of the spores in the atmosphere of the packing shed and on the dust carried by the grader, also by contact between the fruits.

Temperature studies, in which shallow inoculations were made, showed that the infection periods of blue mold were shorter than those of the green mold, but after the green mold appeared it grew faster than did the blue mold. A second series of temperature studies with deep inoculations did not show the same differences in the inoculation periods. The optimum temperature for infection is about 70 to 78° F.

In oranges inoculated with blue and green molds, held for 1 day at 78°, and then kept at 94° for 2 days, 20 per cent inoculation resulted. If kept for 3 days, 10 per cent inoculation resulted, and, if kept for 5 days, no inoculation resulted. Where the inoculations were deep, 7 days at 94° were necessary to prevent inoculation entirely. It was also shown that oranges will not stand a temperature of 94° for more than 4 days without developing a bitter flavor.

Coffee black root fungus [trans. title], W. BALLY (*Meded. Proefsta. Malang, No. 72 (1930), pp. 19, pls. 3, figs. 6; Eng. abs., pp. 15, 16*).—On a coffee estate severely infected with black root fungus, the organism was found to be Rosellinia. On coffee, only undeveloped perithecia were found, but nearby Hevea and Lamtoro (*Leucaena glauca*) showed fully developed perithecia of *R. bunodes*, and the disease resembled the one caused by that fungus, which is described. Control experiments are in progress.

A bacterial gladiolus disease [trans. title], R. FISCHER (*Zentbl. Bakt. [etc.], 2. Abt., 81 (1930), No. 1–7, pp. 80–86, figs. 5*).—The author, dealing with the gladiolus disease widely distributed in Europe and supposedly identical with that due to *Bacterium marginatum* studied by McCulloch as found in many sections of the United States (E. S. R., 52, p. 654), indicates the results of protective work which as detailed includes destruction or exclusion so far as practicable of all material which might carry infection; the overwintering of the bulbs in cool and not excessively damp quarters; the treatment of the bulbs with a wash of 1 per cent Uspulun or Germisan or with 0.5 per cent corrosive sublimate; and as dry a cultivation as is found practicable.

ECONOMIC ZOOLOGY—ENTOMOLOGY

The mammals of Minnesota, T. SURBER (*St. Paul: Minn. Game and Fish Dept., 1932, pp. 84, figs. 39*).—Following an account of the vanished mammals of Minnesota (a retrospect), by T. S. Roberts (pp. 3–13), the big game mammals, the fur bearers, the rodents or gnawers, insectivorous mammals, and the conservation of Minnesota mammals are considered. This is followed (pp. 40–79) by a systematic annotated list of the mammals of Minnesota (class Mammalia).

The fur animals of Louisiana (*La. Dept. Conserv. Bul. 18, rev. (1931), pp. 444, figs. 208*).—This is a revision of a compilation published in 1928 (E. S. R., 60, p. 838).

Factors affecting the breeding of the field mouse (Microtus agrestis), I, II, J. R. Baker and R. M. Ranson (*Roy. Soc. [London], Proc., Ser. B, 110 (1932), No. B 767, pp. 313–322, fig. 1; 112 (1932), No. B 774, pp. 39–46, figs. 2*).—In a study of light (pp. 313–322) the authors have found that the shortening of the daily period of exposure to light from 15 hours to 9 hours almost prevents reproduction in the field mouse (*M. agrestis*). It is the female that is chiefly affected. In a study of temperature and food (pp. 39–46) it was found that when fed on summer food and allowed 15 hours of light each day *M. agrestis* breeds less at low temperatures (about 5° C.) than at summer temperature. The fecundity of the males is not affected by the low temperature. The cutting down of fresh food to a minimum does not hinder reproduction.

Physiology of the temperature of birds, S. P. Baldwin and S. C. Kendeigh (*Cleveland Mus. Nat. Hist. Sci. Pubs., 3 (1932), pp. X+196, pls. 6, figs. 41*).—Following an introduction, the subject is dealt with under the headings of methods of study (pp. 11–21), body temperature of adult birds (pp. 22–104), body temperature of nestling birds (pp. 105–132), and temperature of eggs and nest (pp. 133–154). A bibliography of 12 pages and an index are included.

Several passeriform species were studied, but most of the work was performed on the eastern house wren, *Troglodytes aedon aedon*. To afford a basis for comparing the influence of other factors, the standard temperature was determined, i. e., the body temperature of birds at standard metabolism. For the eastern house wren, this is 104.4° F. (40.2° C.) in the male and 105.0° F. in the female. Standard temperatures determined for four other species are approximately similar. Lethal results follow quickly when the body temperature of the young eastern house wren is raised to 115.9° or above. The degree of body temperature that is lethal is approximately the same for all ages. Excessive heat kills young birds more quickly than does cold. For the nestling eastern house wren, 10 days or older, a drop in body temperature below 60° proves fatal. The temperature of the eastern house wren's egg in the nest was found to fluctuate between the average limits of 98.5 and 93.1°, the higher temperature occurring when the adult is incubating.

Life histories of North American shore birds: Order Limicolae (part 2), A. C. Bent (*U. S. Natl. Mus. Bul. 146 (1929), pp. IX+412, pls. 66*).—This continuation of the series previously noted (E. S. R., 57, p. 357) consists of the second part on the order Limicolae or shore birds (E. S. R., 58, p. 753), the account being presented in connection with a 12-page list of references to the literature.

Life histories of North American gallinaceous birds: Orders Galliformes and Columbiformes, A. C. Bent (*U. S. Natl. Mus. Bul. 162 (1932), pp. XI+490, pls. 93*).—This continuation of the series above noted deals with the orders Galliformes and Columbiformes and includes a 19-page list of references to the literature.

The large wading birds: Long legs and remarkable beaks, as well as size, form, and color, distinguish the herons, ibises, and flamingoes, T. G. Pearson (*Natl. Geogr. Mag., 62 (1932), No. 4, pp. 440–469, pls. 8, figs. 13*).—This second contribution (E. S. R., 68, p. 63) deals with the herons, ibises, and flamingoes and includes eight colored plates prepared by A. Brooks.

Crows, magpies, and jays: Unusual intelligence has earned a unique position for these birds, T. G. Pearson (*Natl. Geogr. Mag., 63 (1933), No. 1, pp. 50–79, pls. 8, figs. 16*).—This third account is accompanied by eight colored plates of crows, magpies, and jays by A. Brooks.

The protection of hawks and owls in Ohio, S. P. Baldwin, S. C. Kendeigh, and R. W. Franks (*Ohio Jour. Sci., 32 (1932), No. 5, pp. 403–424*).—This contribution from the Baldwin Bird Research Laboratory and Western Reserve University, Cleveland, Ohio, reports upon the abundance of hawks, vultures, and owls in Ohio, their food habits and food consumption, relation to control of rodent plagues, and control and conservation measures.

The need for studies in bird control in California, W. L. McAtee (*Calif. Dept. Agr. Mo. Bul., 21 (1932), No. 4–6, pp. 269–286, figs. 9*).—A general discussion pointing out the need for studies in bird control in California.

A study of the cestodes of birds in China [trans. title], T. Shen (*Ann. Parasitol. Humaine et Compar., 10 (1932), No. 2, pp. 105–128, figs. 20*).—The tapeworms found in birds in China, with descriptions of five new species, are dealt with. A list of the forms recognized is included.

Some new species of trematode worms of the genus Leucochloridium carus, parasitic in birds from northern Michigan, with a key and notes on other species of the genus, A. McIntosh (*Jour. Parasitol., 19 (1932), No. 1, pp. 32–53, figs. 9*).—Post-mortem examinations for parasites made during the summers of 1927 to 1929, inclusive, of 189 birds, comprising 63 species, from northern Michigan resulted in the securing of 203 specimens representing the genus Leucochloridium from the cloaca and large intestine of 19 individuals, representing 11 species of birds. Seven species of the genus were identified, 6 of which are here described as new to science. A description is also given of a species of the genus collected in Alaska from Alaska spruce grouse. A key for the separation of the known species of the genus is included.

Studies of the food habits of Utah lizards, G. F. Knowlton and M. J. Janes (*Ohio Jour. Sci., 32 (1932), No. 5, pp. 467–470, fig. 1*).—This contribution from the Utah Experiment Station is based upon a study of 606 lizards collected during the summer of 1931, principally from desert areas in Tooele and Box Elder Counties in northern Utah. Analyses of the stomach contents of the two most common forms, namely, *Uta stansburiana stansburiana* (Baird and Girard) and *Sceloporus graciosus graciosus* (Baird and Girard), are reported upon in tabular form. Nearly all of the forms recovered from the lizard stomachs were injurious or of unknown importance. However, beneficial forms, such as *Geocoris decoratus* Uhl. and *Nabis ferus* (L.), predators, and *Pipunculus* sp. parasites upon the beet leafhopper, were taken, along with some beneficial Hymenoptera, Diptera, and Carabidae.

Gold from goldfish (*Sci. Amer., 147 (1932), No. 5, pp. 268, 269, figs. 7*).—This account of goldfish farming includes information on the biology and methods of production now employed.

Some cross transmission experiments with Gongylonema of ruminant origin, J. T. Lucker (*Jour. Parasitol., 19 (1932), No. 2, pp. 134–141*).—The author has found that a large proportion of larvae of Gongylonema of ruminant origin develop to maturity in pigs to which they have been fed. The Gongylonema removed from the experimental pigs is morphologically indistinguishable from *G. ransomi*. The experiment is regarded as furnishing better evidence than heretofore offered that this species is identical with *G. scutatum*. Administration of infective larvae of Gongylonema of ruminant origin to two dogs, two chickens, and a white mouse did not produce infestations with Gongylonema in these animals. The ruminant Gongylonema has been transmitted to white rats, guinea pigs, and rabbits.

On the basis of the data here presented *G. scutatum* and *G. ransomi* are regarded as synonyms of *G. pulchrum*.

The life cycle of Moniezia expansa, R. Daubney (*Jour. Parasitol., 19 (1932), No. 1, pp. 5–11*).—Work conducted by the division of veterinary research of Kenya Colony with the broad tapeworm of sheep (*M. expansa*) is considered to justify the following conclusions:

Postnatal infestation of lambs is not only possible but commonly occurs. Infestations are contracted by ingestion during grazing. The milk of the ewe or cow is not an essential vehicle for the infective stages. Infestation is not conveyed by the bite of blood-sucking insects or arthropods. Infection is not air borne. It is unlikely that infestation is contracted by eating ectoparasites, since there was ample opportunity to eat parasites when the muzzles were removed for feeding. The only ectoparasites present were keds, which were present on all the animals.

It is pointed out that the following possibilities remain unaffected: (1) The ingestion of the infective stages in small animals or even in plants that may be eaten during grazing, (2) the ingestion of the infective stages derived from the feces of animals acting as intermediary hosts, and (3) the direct ingestion of matured eggs remaining on the pastures, the least probable explanation.

Does yeast affect the growth and infectivity of the nematode Ascaridia lineata (Schneider) in chickens? T. D. Beach and J. E. Ackert (*Jour. Parasitol., 19 (1932), No. 2, pp. 121–129, figs. 2*).—Contributing from the Kansas Experiment Station, the authors report two controlled experiments involving 262 chickens conducted with a view to determining if yeast is a factor in the infectivity and growth of the fowl nematode *A. lineata* when the host chickens are fed different forms of yeast in addition to an adequate diet. These experiments indicate that yeast does not contain a special growth factor for this nematode when used in the presence of an adequate diet, nor does it, under the same conditions, constantly alter the degree of infestation of this nematode.

Entomologists and entomology in Indiana, J. J. Davis (*Ind. Acad. Sci. Proc., 47 (1931), pp. 43–70, figs. 15*).—The entomology of Indiana is dealt with as the presidential address of the Indiana Academy of Science by reviewing the work of the entomologists that have resided in the State, accompanied by photographic reproductions of many. Their taxonomic and economic contributions are considered in the closing part of the address.

The effect of population density upon rate of reproduction with special reference to insects, D. S. Maclagan (*Roy. Soc. [London] Proc., Ser. B, 111 (1932), No. B 773, pp. 437–454, figs. 4*).—Following an introduction the author deals with the subject under the headings of quantitative evidence from recent experiments, interpretation and general biological significance of the results, and mathematical representation of the data, presented in connection with a list of 17 references to the literature.

[Contributions on economic insects and their control] (*Calif. Dept. Agr. Mo. Bul., 21 (1932), No. 7–9, pp. 311–321, 324–339, 347, 350–353, 358–369, figs. 18*).—The contributions on economic insects and their control here presented include the following: *Ephestia figulilella* Greg., a Storage Pest Taken Feeding upon Fresh Grapes, by D. B. Mackie (pp. 311–315); Mexican Fruit Fly [*Anastrepha ludens* Loew] Infestation in the Lower Rio Grande Valley, Texas, by A. C. Fleury (pp. 316–321); Citrus Dusting Equipment, by H. C. Lewis (pp. 324–339); *Dinocleus pilosus* Lec. as a Garden Pest, by H. H. Keifer (p. 339); [Kentucky Wonder Beans] A New Host for Elm Leaf Beetle, by A. C. Browne (p. 347); The Wax Moth as an Enemy of Bees, by H. M. Krebs (pp. 350–353); and Summary of Shade-Tree Insect Activities in California for 1931, by H. E. Burke (pp. 358–369).

[Work in entomology in Michigan] (*Michigan Sta. Bien. Rpt. 1931–32, pp. 30, 31*).—Insects, control work for which is briefly referred to (E. S. R., 65, p. 756), include the fruit tree leaf roller, gladiolus thrips, raspberry mites (*Tetranychus mcdanieli* and *Paratetranychus ilicis*), and flat-headed apple tree borer.

[Report of work in Montana in economic entomology] (*Montana Sta. Rpt. 1931, pp. 42–47, figs. 4*).—Under the heading of protection from insect pests, reference is made to the occurrence of and work with grasshoppers, cutworms, the fruit tree leaf roller, and mosquitoes. Work on the toxicity of insecticides is referred to.

[Occurrence of and work with economic insects in South Carolina] (*South Carolina Sta. Rpt. 1932, pp. 65–79, 115–119, figs. 3*).—The insects considered (E. S. R., 66, p. 652) include the Japanese beetle, now found in South Carolina; periodical cicada; southern cornstalk borer, corn billbug *Calendra callosus*, control of corn ear worm in sweet corn, and boll weevil hibernation at Clemson College, all by O. L. Cartwright; thrips on seedling cotton (E. S. R., 65, p. 155), by J. G. Watts; oriental fruit moth (E. S. R., 66, p. 53; 68, p. 222), codling moth studies, and giant root borers (*Prionus imbricornis* (L.) and *Archodontes melanopus* (L.)), all by W. C. Nettles; Mexican bean beetle and tomato fruit worm, both by F. Sherman; and boll weevil studies at the Pee Dee Substation, by F. F. Bondy.

[Work with economic insects in South Dakota], H. C. Severin (*South Dakota Sta. Rpt. 1932, pp. 19–21*).—Brief reference is made to the progress of studies (E. S. R., 67, p. 50) of Cyrtacanthacrinae grasshoppers and their control, and pollinating agents of sweetclover.

[Report of work in economic entomology in Washington] (*Washington Col. Sta. Bul. 275 (1932), pp. 23, 24, 31–34, 65, 66*).—Reporting upon the work of the year (E. S. R., 66, p. 754), data are given on the chemistry of oil sprays, by K. Groves; oil sprays, toxicity of arsenicals, and efficiency of fluorine compounds and nicotine tannate, by R. L. Webster, A. Spuler, and J. Marshall; the potato flea beetle, by A. J. Hanson at the Western Washington Station (E. S. R., 67, p. 578); and dormant sprays for scale control, sprays for fireworm, and nicotine tannate in cranberry pest control, all by D. J. Crowley at the Cranberry Substation (E. S. R., 66, p. 756).

[Work in entomology in West Virginia] (*West Virginia Sta. Bul. 254 (1932), pp. 34–38, fig. 1*).—The work considered (E. S. R., 66, p. 553) includes that with adherence and distribution of arsenical residues, control of the apple aphids, the weather factor in insect control, and control measures for garden insects.

[Report of work in entomology and parasitology in Wyoming] (*Wyoming Sta. Rpt. 1932, pp. 24, 29*).—The work of the year referred to (E. S. R., 67, p. 57) includes that with American foulbrood; and lungworms, by J. W. Scott.

Transactions of the German Association of Applied Entomology, 1930 [trans. title] (*Verhandl. Deut. Gesell. Angew. Ent., 8 (1930), pp. 87, pl. 1, figs. 14*).—The contributions presented at the annual meeting of the association held in August, 1930, include the following: Conditions Affecting the Increase of Insects, by E. Martini (pp. 19–26); The Influence of Heat on the Oviposition of Mosquitoes, by O. Hecht (pp. 26–29); Introductory Contribution on the Pine Geometrid [*Bupalus piniarius*], by K. Friederichs (pp. 31–36); Biological Data Obtained in Arsenical Control Work with the Pine Geometrid [*Bupalus piniarius*], by E. May (pp. 38–40); Findings in Control Work with the Pine Geometrid [*Bupalus piniarius*], by R. Meyer (pp. 40–44); The Results

of Control Work with the Mole Cricket [*Gryllotalpa vulgaris* L.] in Italy (pp. 45–49) and Control of the Cherry Fruit Fly [*Rhagoletis cerasi* L.] in Italy (pp. 49–54), both by E. Malenotti; Studies of the Galleries of the Bark Beetles, by I. Trägårdh (pp. 54–64); On the Distribution of the Bark Beetles (Ipidae) in Finland, with Particular Reference to Their Occurrence in the Northern Forest Reaches, by U. Saalas (pp. 65–71); Zoogeographical Distribution of the Bark Beetles in the Republic of Czechoslovakia, by A. Pfeffer (pp. 72–76); On the Appearance of and Control Work with the Horseradish Leaf Beetle (*Phaedon cochleariae* Fab.) in Finland, by Y. Hukkinen (pp. 76–84); and The Importance of Hydrogen-Ion Concentration for the Development of Mosquito Larvae, by W. Buchmann (pp. 84–87).

Report on the work of the entomological division, J. C. Hutson (*Ceylon Admin. Rpts., Sect. IV, Dept. Agr., 1931, pp. D111–D121*).—The occurrence of and work with the more important insects of the year in Ceylon is dealt with (E. S. R., 67, p. 426).

Principal insect pests of Cyprus, H. M. Morris (*Cyprus Dept. Agr. Bul. 3 (1932), pp. 21–42, figs. 11*).—The more important insect pests of Cyprus are briefly dealt with.

Annual report of Government entomologist, 1931, H. W. Simmonds (*Fiji Dept. Agr. Ann. Bul., 1931, pp. 9–12*).—This is a brief account of the occurrence of and control work with the more important insects of the year, also of the control of noxious weeds through attack of insect enemies.

Entomological investigations, G. A. Julius et al. (*Aust. Council Sci. and Indus. Res. Ann. Rpt., 5 (1930–31), pp. 18–21*).—A brief report (E. S. R., 65, p. 547) is given of the occurrence of and work with the more important insect pests of the year.

Report of the chief entomologist, R. Veitch (*Queensland Dept. Agr. and Stock, Ann. Rpt., 1931–32, pp. 51–55*).—The occurrence of and work with the more important insect pests of the year are reported.

Vegetable insects and their control, A. G. Dustan (*Canada Dept. Agr. Bul. 161, n. ser. (1932), pp. 74, figs. 65*).—A practical account of vegetable insects and their control under Canadian conditions.

Some pest control problems of the Argentine fruit grower, H. D. Greene (*Calif. Dept. Agr. Mo. Bul., 21 (1932), No. 4–6, pp. 258–268, figs. 5*).—This contribution includes a list of 16 principal insect pests of Argentine citrus and some 25 insect pests of less importance. Sixteen species are listed as principal insect pests of general fruit crops in Argentina.

[Contributions on fruit insects and their control] (*Univ. Bristol, Agr. and Hort. Res. Sta. Ann. Rpt. 1931, pp. 77–82, pls. 4; 83–100; 112–117*).—The contributions presented (E. S. R., 67, p. 284) are as follows: Carabid Beetles as Strawberry Pests in the Cheddar Districts, by C. L. Walton and H. G. H. Kearns (pp. 77–82) (E. S. R., 66, p. 557); The Control of Capsid Bugs [*Plesiocoris rugicollis and Lygus pabulinus*] on Black Currants—Field Experiments in 1931 (pp. 83–88) and Field Trials of Tar Distillate—Heavy Paraffin Washes for Apple Capsid Bug (*P. rugicollis*) Control (Season 1930–31) (pp. 89–100), both by L. N. Staniland and C. L. Walton; and Some Observations on the Control of the Apple Sawfly *Hoplocampa testudinea* (Klug.), by H. G. H. Kearns and T. Swarbrick (pp. 112–117).

Coconut Committee entomological report, R. W. Paine (*Fiji Dept. Agr. Ann. Bul., 1931, pp. 1–6*).—This is a report upon work conducted during the year, particularly against the coconut spike moth (*Tirathaba trichogramma* Meyr.). The parasite *Apanteles tirathabae* Wilk., introduced from Java in February, 1930, is said to have spread rapidly in and around Suva, para-

sitism by it having reached a maximum of 62 per cent. Particular mention is also made of the occurrence of and work with the coconut scale (*Aspidiotus destructor*) and the coconut leaf miner (*Promecotheca reichei*).

Insects of coconuts in Malaya, G. H. CORBETT (*Straits Settlements and Fed. Malay States Dept. Agr., Gen. Ser. No. 10 (1932), pp. [4]+106, pls. 19, figs. 2*).—An account is given of the important insect enemies of coconuts in the Malay Peninsula, including natural enemies and means of control.

A survey of the damage caused by insects to hardwood timbers in Great Britain, R. C. FISHER, F. R. CANN, and E. A. PARKIN ([*Gt. Brit.*] *Dept. Sci. and Indus. Res., Forest Prod. Res. Bul. 16 (1932), pp. VI+27, pls. 11*).—Following a report of the methods employed, the conditions found are dealt with at length, including damage caused by Lyctus powder-post beetles (pp. 3–18) (E. S. R., 61, p. 855) and damage caused by other wood-boring insects (pp. 18–22). "Consideration of the results of this rapid but extensive survey shows that serious losses are being caused to the timber trades as a result of the activities of insects, particularly of the Lyctus powder-post beetles. These wood borers are by far the most important of the timber insects recorded during this investigation. All trades and industries using susceptible hardwoods are involved, and each has its own part to play in the application of methods of control."

Medical entomology, R. MATHESON (*Springfield, Ill.: Charles C. Thomas, 1932, pp. XII+489, pls. 2, figs. 211*).—In this introductory text the author has brought together information on insects and other arthropods in their relation to the health of man. The account is presented in 20 chapters, to each of which a list of references to the more important literature is appended.

Insecticides and their uses, J. J. DAVIS (*Purdue Univ., Pharm. Ext. Ser. 1 (1932), pp. 56, figs. 6*).—This is a practical summary of information on the subject contributed from the Indiana Experiment Station.

Rotenone, the active principle of derris root, I–XIII [trans. title], S. TAKEI, S. MIYAJIMA, and M. ŌNO (*Inst. Phys. and Chem. Res. [Tokyo] Sci. Papers, 19 (1932), No. 376, pp. 26*).—A report on the chemistry of rotenone.

Fermenting baits for trapping Elateridae and Cerambycidae (Coleop.), A. B. CHAMPLAIN and J. N. KNULL (*Ent. News, 43 (1932), No. 10, pp. 253–257*).—Fermenting baits consisting of various grades of molasses or brown sugar mixed with water were successfully employed by the authors during the past five years as attrahents in collecting various beetles in Pennsylvania. A list is given of the captures of Elateridae, Melasidae, Cerambycidae, Cleridae, and Buprestidae.

The effect of hydrocyanic acid gas fumigation on the subsequent growth of pecan nursery stock, R. J. WILMOT (*Fla. Ent., 16 (1932), No. 2, pp. 28–30*).—The differences observed between fumigated trees and checks, which are recorded in detail in tabular form, led to the conclusion that under the conditions of the experiment the fumigation of pecan nursery stock does not have a detrimental effect upon its succeeding growth.

The Orthoptera of Minnesota, M. HEBARD (*Minnesota Sta. Tech. Bul. 85 (1932), pp. 61, fig. 1*).—The introduction to this contribution includes a list of localities in Minnesota cited in the report, with indication of their faunal relationship. A key is given to the species of Orthoptera found in the State (pp. 7–20). Notes are then presented on the 129 species and races known to occur in the State, representing the Blattidae, Phasmidae, Acrididae, Tettigoniidae, and Gryllidae.

[The range grasshopper problem], E. D. BALL (*Arizona Sta. Rpt. 1932, p. 90*).—A brief statement of the findings of the year.

The correlation of sunspot periodicity with grasshopper fluctuation in Manitoba, N. Criddle (*Canad. Field Nat., 46 (1932), No. 9, pp. 195–199, fig. 1*).—This discussion of the subject is presented in connection with a list of 28 references to the literature.

Further studies of the biology of the migratory locust (Pachytylus migratorioides Reiche and Fairm.), Locustidae Orthoptera, S. S. Gonzales (*Philippine Jour. Agr., 3 (1932), No. 1, pp. 1–38, pls. 7*).—Studies of *P. migratorioides*, commenced in December, 1928, and conducted in the laboratory at Alabang, Rizal, and in fields of the several Provinces infested with the pest, are reported upon. Considerable damage has been done by this grasshopper to Philippine crops, particularly rice, corn, sugarcane, and coconut.

The life of the religious mantis, L. Binet (*La Vie de la Mante Religieuse. Paris: Vigot Bros., 1931, pp. 93, figs. 5*).—This is an account of the morphology and biology of *Mantis religiosa* L., presented in connection with a bibliography of six pages.

Bionomics of some thrips injurious to cultivated plants in south India, T. V. Ramakrishna Ayyar (*Agr. and Livestock in India, 2 (1932), No. 4, pp. 391–403, pls. 4, fig. 1*).—The species of thrips here dealt with include *Scirtothrips dorsalis* Hood, a major pest of the chili or pepper crop and occurring on other plants, including castor; the onion thrips; rice thrips (*Thrips oryzae* W.); grapevine thrips (*Rhipiphorothrips cruentatus* H.); sugarcane thrips (*Bregmatothrips ramakrishnae* Bagn.); banded wing thrips (*Heliothrips indicus* Bagn.); red-banded thrips; greenhouse thrips; turmeric thrips (*Panchaetothrips indicus* Bagn.); and the Mimusops thrips (*Arrhenothrips ramakrishnae* H.).

Report of a study of the morphology, biology, and control of Haplothrips cottei Vuil., a new enemy of carnations in Egypt, A. A. A. E. Ghabn (*Zur Biologie und Bekämpfung eines Neuen Nelkenschädlings aus der Gruppe der Thysanopteren in Aegypten. Inaug. Diss., Landw. Hochsch., Berlin, [1931]. pp. 71, figs. [20]*).—The biology and control of a new thrips enemy of carnations in Egypt is dealt with.

Thrips as pests of glasshouse plants, E. R. Speyer (*Expt. and Res. Sta., Cheshunt, Herts, Ann. Rpt., 17 (1931), pp. 49–54*).—The species noted are the onion thrips and the rose thrips (*Thrips fuscipennis* Hal.).

Contributions towards a knowledge of the Thysanoptera of Egypt, I–VII, H. Priesner (*Bul. Soc. Roy. Ent. Egypte, 22 (1929), Nos. 1–3, pp. 59–63, figs. 7; 4, pp. 211–219, figs. 6; 23 (1930), No. 1, pp. 6–15, figs. 7; 24 (1931), No. 2, pp. 127–131, figs. 2; 25 (1932), No. 1–2, pp. 2–12, figs. 5, pp. 17–23, pl. 1, figs. 6, pp. 45–51, figs. 2*).—Included in these contributions are descriptions of 7 new genera and 16 new species.

A biological study of the Hemiptera which attack the filbert nut tree in Sicilia [trans. title], F. B. Boselli (*Bol. Lab. Zool. Gen. e Agr. R. Ist. Super. Agr. Portici, 26 (1932), pp. 142–309, pls. 2, figs. 52*).—An extended account in three parts.

A contribution to the knowledge of Anarsia lineatella Zell. and notes on Recurvaria nanella Hbn. [trans. title], G. Puppini (*Bol. Lab. Ent. R. Ist. Super. Agr. Bologna, 3 (1930), pp. 182–220, pls. 2, figs. 18*).—An account of the peach twig borer, which in north Italy has two generations that attack almond, peach, apricot, plum, cherry, etc., and of the lesser bud moth, which mines the fruits of a variety of deciduous trees. A list is given of 58 references to the literature.

Climate and Helopeltis.—I, The influence of relative humidity on Helopeltis in Sumatra [trans. title], J. K. de Jong (*Arch. Theecult. Nederland. Indië, No. 3 (1931), pp. 135–142, fig. 1; Eng. abs., p. 142*).—It is pointed out that

although more than 15 years have elapsed since Helopeltis was first discovered on tea in Sumatra, the species has never developed as a pest and it is considered highly improbable that it will ever do so.

The coffee capsid bug (Lygus simonyi Reut.) and the use of kerosene extracts of pyrethrum for the control of "Lygus" and "Antestia," R. H. Le Pelley (*Kenya Colony Dept. Agr. Bul. 22 (1932), pp. 18*).—The first part of this contribution (pp. 1–5) deals with *L. simonyi* and part 2 (pp. 5–18) with kerosene extracts of pyrethrum for the control of *L. simonyi* and *A. orbitalis lineaticollis* (Westw.) Stål.

The food plants of the leafhoppers formerly included in the genus Platymetopius Burm., E. D. Ball (*Canad. Ent., 64 (1932), No. 11, pp. 251–255*).—Observations of species of eight genera formerly referred to the genus Platymetopius are recorded. It is pointed out that observations of the last few years have shown that in a number of important groups the food plants are rarely, if ever, grasses, as was previously supposed to be the case.

The larger horned citrus bug (Biprorulus bibax Breddin), W. A. T. Summerville (*Queensland Dept. Agr. and Stock, Div. Ent. and Plant Path. Bul. 8 (1931), pp. 37, pls. 9*).—This contribution deals with *B. bibax* in Queensland, its morphology, biology, and means of control.

The Aphidae of Colorado, Part II, C. P. Gillette and M. A. Palmer (*Ann. Ent. Soc. Amer., 25 (1932), No. 2, pp. 369–496, figs. 108*).—The second part of this contribution from the Colorado Experiment Station (E. S. R., 67, p. 53) deals with the tribe Aphini and the subtribe Aphina. Keys are given for the separation of the genera represented, particularly the genus Aphis, represented by 73 species and 1 variety, and Rhopalosiphum, represented by 13 species. The genus Flabellomicrosiphum is erected and 1 species described as new.

Six new aphids from Florida, with description of the sexual forms of another species, A. N. Tissot (*Fla. Ent., 16 (1932), No. 1, pp. 1–13, figs. 50*).—This contribution from the Florida Experiment Station gives descriptions of three new species of the genus Cinara and one each of the genera Calaphis, Neosymdobius, and Therioaphis.

Three new aphids of the tribe Chaitophorini, A. N. Tissot (*Fla. Ent., 16 (1932), No. 2, pp. 17–24, figs. 29*).—In this contribution from the Florida Experiment Station *Chaitophorus longipes* and *Sipha minuta*, both found feeding on the leaves and twigs of willows at Gainesville, Fla., and *Patchia obscura*, rather common on the leaves of some of the oaks in northern Florida, are described as new to science

The lantana bug (*Mysore Dept. Agr. Circ. 46 (1931), pp. 3, pls. 2*).—It is pointed out that in Mysore the greenhouse orthezia does not confine itself to lantana, a list being given of 36 different cultivated plants which it is known to attack.

Coffee mealy bug research, H. C. James (*Kenya Colony Dept. Agr. Bul. 18 (1932), pp. 18*).—A discussion of work under way in Kenya with species of Pseudococcus.

Biology of the pink mealy bug of sugar cane, Trionymus sacchari (Cockerell), in the Philippines, L. B. Uichanco and F. E. Villanueva (*Philippine Agr., 21 (1932), No. 4, pp. 205–276, pls. 8, figs. 14*).—In this contribution from the Philippine Experiment Station the author deals with one of the most common of the sucking insects of sugarcane, *T. sacchari*, it being of wide distribution in the Archipelago and found in all months of the year. The account is presented in connection with a four-page list of references to the literature.

Contributions to a knowledge of the white flies (Aleurodidae) of Egypt. I. H. Priesner and M. Hosny (*Egypt Min. Agr., Tech. and Sci. Ser. Bul. 121*

(*1932*), *pp. 8, pls. 6*).—This first contribution consists of a description and notes on the life history and habits of a new species of Siphoninus which is a pest on pomegranates, namely, *S. granati*. A brief account of *Encarsia partenopea* Masi, which parasitizes this new white fly, is included.

The effects of temperature and humidity on oviposition, incubation, and emergence in the lac insect, Laccifer (Tachardia) lacca Kerr (Coccidae), and on the resulting lac crop, P. M. Glover, P. S. Negi, M. P. Misra, and S. N. Gupta (*Indian Lac Res. Inst. Bul. 6* (*1932*), *pp. 18*).—This is a report of observations conducted in continuation of those by Negi, previously noted (E. S. R., 62, p. 854).

Comparative study of lac hosts, with special reference to Acacia catechu and Cassia florida, A. K. Thakur (*Indian Lac Res. Inst. Bul. 9* (*1932*), *pp. 8*).—Among the factors which influence the suitability of a host for lac infection, the sap reaction and sap density have been found to be of possible importance. In the case of *C. florida* it has been shown that the amount of available food supplies and seasonal growth periods offer no explanation of its unsuitability.

Investigations on two white wax scales (Ceroplastes) as pests in Australia, E. H. Zeck (*Agr. Gaz. N. S. Wales, 43* (*1932*), *No. 8, pp. 611–616, figs. 4*).—This contribution relates to the Indian white wax scale *C. ceriferus*, found on some garden plants and native shrubs, and the African white wax scale *C. destructor*, which infests citrus orchards.

Report upon a collection of Chermidae (Homoptera) from New Zealand, G. F. Ferris and F. D. Klyver (*New Zeal. Inst. Trans. and Proc., 63* (*1932*), *pt. 1, pp. 34–71, pls. 10*).—Twenty-seven species of this group of economic insects are recognized as occurring in New Zealand, of which 22 are described as new to science. The genus Ctenarytaina is erected.

The plum scale (Eulecanium corni Bouchè) in the Province of Trieste [trans. title], N. Cuscianna (*Bol. Lab. Zool. Gen. e Agr. R. Ist. Super. Agr. Portici, 24* (*1929–1931*), *pp. 279–298, figs. 7*).—An account of the morphology, biology, and control of *E. corni*, officially known as the European fruit lecanium, in the Italian Province of Trieste.

Caterpillar pests of the tea plant, and of green manure plants and shade trees in use on tea estates, II, III, E. A. Andrews (*Indian Tea Assoc., Sci. Dept. Quart. Jour., 1931, Nos. 3, pp. 129–138; 4, pp. 189–202*).—These accounts are in continuation of that previously noted (E. S. R., 63, p. 52).

A contribution to the knowledge of Hyponomeuta padellus L., H. cognatellus Hbn., and H. vigintipunctatus Retz. [trans. title], A. Servadei (*Bol. Lab. Ent. R. Ist. Super. Agr. Bologna, 3* (*1930*), *pp. 254–301, pls. 5, figs. 19*).—A report of studies of the morphology, biology, and control of the ermine moth, an enemy of the apple, hawthorn, and plum; of *H. cognatellus*, living on *Euonymus europaea* and *E. japonica;* and of *H. vigintipunctatus* on *Sedum maximum*.

Sod webworms and their control in lawns and golf greens, W. B. Noble (*U. S. Dept. Agr. Circ. 248* (*1932*), *pp. 4*).—A brief account is given of the life history and habits of larvae of moths of the genus Crambus, known as sod webworms, which caused severe injury to lawns and golf greens during the summer of 1931, and of their natural and artificial control. While natural enemies have usually held these pests in check, the infestation may become heavy and artificial control measures necessary.

In experimental control work commercial pyrethrum extract, 1 oz. to 4 gal. of water, applied to the infested turf at the rate of about 1 gal. to 1 sq. yd. of surface, gave good control. Homemade kerosene emulsion, made according to the following formula, also gave excellent control: 1 lb. of laundry soap,

1 gal. of boiling water, 0.5 gal. of kerosene, thoroughly emulsified. One part of this stock emulsion was diluted with 50 parts of water and applied to the infested turf at the rate of about 1 gal. to 1 sq. yd. of surface, application being made with an ordinary watering pot or sprinkling can. Other insecticides tested, including carbon disulfide emulsion, Paris green, lead arsenate, 40 per cent nicotine sulfate, poisoned bran mash bait, calcium cyanide dust, and sodium cyanide solution gave little or no control.

The relation of hydrocyanic acid gas concentration and temperature to the kill of the larvae in hibernacula of the pecan leaf case bearer, Mineola juglandis (LeB.), R. J. WILMOT and F. W. WALKER (*Fla. Ent., 16 (1932), No. 2, pp. 25–28*).—This is a joint contribution from the Florida State Plant Board and the Florida Experiment Station, the details of which are presented in tabular form. The work shows that 100 per cent control of the larvae of the pecan case bearer in hibernacula can be obtained only with an exposure of at least 30 minutes to a concentration of 0.20 per cent hydrocyanic acid gas or more when the temperature in the fumigation box is held at 90° F. A control of 100 per cent may be attained in 30 minutes at 71° if the concentration is approximately 0.72 per cent hydrocyanic acid gas.

A study of the forage moth, Ptycopoda herbariata F. [trans. title], G. S. CANDURA (*Bol. Lab. Zool. Gen. e Agr. R. Ist. Super. Agr. Portici, 24 (1929–1931), pp. 233–266, figs. 10*).—An account is given of the morphology, biology, and importance of this enemy of forage crops.

A morphological and biological note on Simaethis nemorana Hb. [trans. title], N. CUSCIANNA (*Bol. Lab. Zool. Gen. e Agr. R. Scuola Super. Agr. Portici, 20 (1927), pp. 17–34, figs. 11*).—A tineid moth which causes serious injury to the fig in Italy, particularly through feeding on the leaves, is dealt with. Information on five hymenopterous and two dipterous parasites is included.

The carnation caterpillar Tortrix pronubana Hb. [trans. title], C. COLIZZA (*Bol. Lab. Zool. Gen. e Agr. R. Scuola Super. Agr. Portici, 20 (1927), pp. 42–59, figs. 9*).—An account of the morphology, biology, and parasites of a tortricid that attacks the shoots and leaves of the carnation in Italy.

The insect parasites and predators of Pyrausta nubilalis Hbn. [trans. title], A. GOIDANICH (*Bol. Lab. Ent. R. Ist. Super. Agr. Bologna, 4 (1931), pp. 77–218, pls. 2, figs. 33; abs. in Rev. Appl. Ent., 20 (1932), Ser. A, No. 8, pp. 445, 446*).—This contribution to the knowledge of the insects attacking hemp deals at length with enemies of the European corn borer, the most important enemy of the crop in Europe. Some 100 species of parasites, hyperparasites, and predators recorded from various parts of the world up to the end of 1931 are reviewed, with notes on their distribution and the synonymy, morphology, and biology of many. A list of 212 references to the literature is included.

A biography of the Angoumois grain moth, P. SIMMONS and G. W. ELLINGTON (*Ann. Ent. Soc. Amer., 25 (1932), No. 2, pp. 265–281*).—Following an introduction, the authors deal briefly with the Angoumois grain moth, its history in Europe and in the United States, and its world spread.

A contribution to the knowledge of the Angoumois grain moth (Sitotroga cerealella Oliv.) [trans. title], G. S. CANDURA (*Bol. Lab. Zool. Gen. e Agr. R. Scuola Super. Agr. Portici, 19 (1926), pp. 19–102, figs 18*).—This contribution is presented in connection with a seven-page list of references to the literature.

Observations on the flight of noctuid moths, W. W. STANLEY (*Ann. Ent. Soc. Amer., 25 (1932), No. 2, pp. 366–368*).—This contribution from the Tennessee Experiment Station gives a list of 29 species and 3 unidentified species of noctuid moths caught at night on a 17-story and an 18-story building in Knoxville, Tenn.

Progress report on studies of the pale western cutworm, Agrotis orthogonia Morrison, F. P. Eshbaugh ([*Oklahoma*] *Panhandle Sta., Panhandle Bul. 45 (1933), pp. 14, figs. 3*).—This is a report of studies of the pale western cutworm in the Panhandle region of Oklahoma, studies of which pest in Montana by Cook and others have been noted (E. S. R., 63, p. 159). The account considers the area infested, observations on its life history, differentiation of related species, and natural and artificial control.

So far as can be ascertained, the pest made its first invasion of the Panhandle of Oklahoma in 1928, the eggs laid resulting in a generation of cutworms in the spring of 1929 of sufficient size to cause damage to several hundred acres of wheat. In 1930 it appeared in still larger numbers, fields in two western counties of the Panhandle having been invaded to such an extent that comparatively few were entirely free from damage to a greater or lesser degree. It has caused damage in all three of the Panhandle counties. Feeding on the tender wheat stems just below the surface of the soil, the larvae soon cause the plants to turn yellow and gradually die, leaving bare spots in the field where the invasion takes place.

Observations on a unidirectional flight of army cutworm moths and their possible bearing on aestivation, J. H. Pepper (*Canad. Ent., 64 (1932), No. 11, pp. 241, 242*).—This contribution from the Montana Experiment Station reports upon the collection of army cutworm moths on July 14, 1931, in a canyon near Bozeman, Mont., during what appeared to be a rather definite flight of the moths. Observations of this flight suggest that possibly a migration occurs to higher elevations, where estivation may be successfully completed at lower temperatures than those experienced on the plains.

Light traps kill insects (*Amer. Agr., 129 (1932), No. 38, p. 6*).—In light trap experiments conducted in orchards at Hilton, N. Y., during a period of four years, the fruit from the lighted unsprayed trees and the unlighted sprayed trees was of about the same quality, but more than twice as good with respect to codling moth injury as that on trees which received no protection. The fruit from trees that were both sprayed and lighted was, on the average, about three times better than the unsprayed lighted trees and unlighted sprayed trees and six times better than the unsprayed unlighted trees as regards codling moth injury, as shown by the data thus far tabulated.

The races of A. maculipennis, L. W. Hackett, E. Martini, and A. Missiroli (*Amer. Jour. Hyg., 16 (1932), No. 1, pp. 137–162, figs. 5*).—The authors describe the structural differences between the eggs, larvae, and male hypopygia of the two races of *Anopheles maculipennis*, namely, *A. maculipennis labranchiae* Flni. and *A. maculipennis messeae* Flni. It is pointed out that the use of the egg as a differentiating character should make it possible to classify *A. maculipennis* populations and to determine the bionomics of each race and its relation to the transmission of malaria.

The effects of heat and of cold upon Aëdes (Stegomyia) aegypti, N. C. Davis (*Amer. Jour. Hyg., 16 (1932), No. 1, pp. 177–191*).—Part 1 of this contribution deals with the survival of yellow-fever mosquito eggs under abnormal temperature conditions (pp. 177–183) and part 2 with the effect of high and of low temperatures upon the vital activities of adult yellow-fever mosquitoes (pp. 183–189).

The seasonal life history of Anopheles maculipennis with reference to humidity requirements and "hibernation," S. B. Freeborn (*Amer. Jour. Hyg., 16 (1932), No. 1, pp. 215–223, figs. 3*).—In the central Sacramento Valley of California, where there are six generations of *A. maculipennis* Meig., the adults of the second and possibly the third generation are said to have a relatively short life, too short to transmit malaria but long enough to oviposit.

Information on the seasonal abundance of adults and larvae based upon weekly catches, survival of adults at given temperatures and varying humidities, etc., are summarized in graph form.

[Contributions on the biology and methods of study of anopheline mosquitoes] (*Amer. Jour. Hyg., 16 (1932), No. 3, pp. 832–844, figs. 3*).—The contributions presented include the following: On Large Scale Rearing of *Anopheles quadrimaculatus* in Captivity, by M. F. Boyd and T. L. Cain, jr. (pp. 832–835); and A note on the Preparation of Anopheline Dissections for Examination (pp. 836–838) and Methods for the Manipulation and Conservation of Anopheline Imagines (pp. 839–844), both by M. F. Boyd.

Certain pathological effects of ultra-violet radiation on mosquito larvae and pupae, M. E. MacGregor (*Roy. Soc. [London], Proc., Ser. B, 112 (1932), No. B 774, pp. 27–38, pl. 1*).—Irradiation of the larvae and pupae of the yellow-fever mosquito and *Culex* (*Culex*) *pipiens* L. with ultra-violet radiation has been shown to cause a peculiar form of fatal injury to the insects. "Particulars are given of the technic employed and of the results of numerous experiments that were carried out to determine the wave lengths of the radiations responsible for this particular type of injury, the minimum exposure required for the production of 'paralysis,' to ascertain the relative susceptibility of larvae of various instars and also of pupae, and the effect of 'local' irradiation. The histolysis of the tissues which results is found to be of a progressive type, affecting not only the cells which have themselves been subjected to irradiation but also the adjacent cells from which the injury continues to spread. The histological nature of the injury is briefly described."

The effect of various chemicals on the larva and pupa of Culex pipiens at various temperatures, B. J. Baroody (*Jour. Elisha Mitchell Sci. Soc., 48 (1932), No. 1, pp. 125–129*).—The tests here reported have shown that in solutions of chemicals the death of larval and pupal mosquitoes occurs more quickly at higher than at lower temperatures, tests having been made at 5, 11, and 23° C. The larger larvae are more resistant than those of smaller size, and pupae are more resistant than larvae, probably because of tougher integument. Iodine was quite effective as an insecticide against larvae but not against pupae. It was found that a 0.0004 per cent mixture of copper sulfate, mercuric chloride, iodine, and formaldehyde kills larvae and pupae overnight. It is thought that this mixture has possibilities of becoming an effective larvicide.

New Jersey Mosquito Extermination Association, nineteenth annual meeting (*N. J. Mosquito Extermin. Assoc. Proc., 19 (1932), pp. 133+[2], pls. 12*).—The contributions presented at this meeting (E. S. R., 65, p. 656) include the following: Notes on the More Important Mosquitoes of Western Canada, by E. Hearle (pp. 7–14); What Workers with Mosquitoes Have Accomplished around the World in 1930 and 1931, by F. C. Bishopp (pp. 15–36); A Summary of New Jersey Mosquito Control Accomplishments in 1931, by F. W. Miller (pp. 37–52); The Extent of the Mosquito Problem in Connecticut and Its Solution, by W. E. Britton and R. C. Botsford (pp. 52–55); Sewage Treatment Works and Mosquito Breeding, by W. Rudolfs (pp. 56–60); A Message from the Federated Women's Clubs of New Jersey, by M. C. Heine (pp. 61–63); Mosquito Control Activities and Investigations of the United States Public Health Service, by L. L. Williams, jr. (pp. 64–69); The Development and Use of Machinery for Crushing Grasses, Reeds, and Sedges on the Salt Marshes, by J. P. Peterson (pp. 70–72); The Aeroplane as an Aid in Inspection and Survey Work, by F. W. Miller (pp. 73–78); The Mosquito Problem and a Résumé of Current Control Activities on Cape Cod, by H. Myhre

(pp. 79–81); Observations on the Biology of *Mansonia perturbans* (Walk.) Diptera, Culicidae, by T. E. McNeel (pp. 91–96); The Use of the Aeroplane for the Distribution of Oils and Larvicides, by R. L. Vannote (pp. 97–102); The Effort to Control Mosquitoes in New York City, by T. E. Freston (pp. 102–104); The Development of Mechanical Equipment for Sampling the Mosquito Fauna and Some Results of Its Use, by T. J. Headlee (pp. 106–128); One Year's Experience with Pyrethrum Larvicide, by L. W. Smith (pp. 128–131); and Mosquito Control in Nassau County, by E. Butchard (pp. 131–133).

Some studies on the breeding media, development, and stages of the eye gnat Hippelates pusio Loew (Diptera: Chloropidae), D. G. Hall, jr. (*Amer. Jour. Hyg., 16 (1932), No. 3, pp. 854–864, figs. 8*).—This is a report of studies of *H. pusio*, which is abundant in southern California and one of the limiting factors in the development of the Coachella Valley. The adults of this eye gnat are said to be present in this locality during the entire year, but are most abundant in the spring and fall. "Oviposition may occur throughout the year, the eggs being deposited singly and promiscuously on or near the larval food. The incubation period varies with the temperature and moisture, averaging about 3.7 days during favorable seasons. The larvae are capable of developing on excrement and in a number of decaying materials. On human excrement the length of the larval stage averaged about 11.4 days, upon dog manure the length of the stage averaged about 8.7 days, and upon decaying oranges about 17 days. Fermenting or sour substances were unfavorable for larval growth. The larvae developed readily on excrement and upon materials in advanced stages of decay. Figs were found unfavorable when sour but very favorable when the fruit was broken down by decomposition. Pupation occurs either in the food upon which the larvae develop or in the sand surrounding such media. The depth in the medium at which pupation occurs depends upon the amount of moisture present. The average pupal stage was found to be about 9.8 days.

"These studies suggest that the problem is one of sanitation as well as one of agricultural practice."

A box-type trap to aid in the control of eye gnats and blowflies, D. C. Parman (*U. S. Dept. Agr. Circ. 247 (1932), pp. 4, fig. 1*).—This account consists of an illustrated description of a new trap devised by the author for capturing the eye gnat *Hippelates pusio* Loew, together with its operation and the results obtained from its use.

It is said that at the present time this type of trap is the principal reliance for control of the eye gnats in that valley, where the eye gnat population appears to have been decimated during the last two seasons by its use. One of these traps captured 988,000 eye gnats and 2.5 gal. of flies of various species in 9 days, practically 100 per cent of the eye gnats having been females. Tests indicate that the traps are also quite efficient in capturing screw worm flies and black blowflies (*Phormia regina* Meig.). It is pointed out that this type of trap can be accommodated to many sizes, the larger traps being used for disposal of large quantities of garbage and large carcasses of ranch animals; insects can be prevented from entering the bait chamber to breed; and that insects breeding in the bait chambers are retained. The work indicates that a windmill bait agitator installed in the box-type trap may increase the catch of blowflies and does materially increase the catch of eye gnats.

Late fall activity and spring emergence of the Hessian fly in Iowa, C. J. Drake and G. C. Decker (*Ann. Ent. Soc. Amer., 25 (1932), No. 2, pp. 345–349, figs. 2*).—This contribution from the Iowa Experiment Station reports upon observations made of the Hessian fly in several localities in Iowa.

Buffalo fly investigations: A note on the occurrence of Hydrotaea australis Malloch in northern Australia, I. M. Mackerras (*Jour. Council Sci. and Indus. Res.* [*Aust.*], *5 (1932), No. 4, pp. 253, 254*).—A brief account of a muscid fly whose larvae live in dung and are predatory upon the larvae of other flies, including the stable fly, horn fly, and the buffalo fly, all of which breed in cattle or buffalo dung.

Investigations on the buffalo fly (Lyperosia exigua de Meij.) and its parasites in Java and northern Australia, E. Handschin (*Aust. Council Sci. and Indus. Res. Pamphlet 31 (1932), pp. 24, figs. 2*).—In this contribution on *L. exigua*, attention is given to its control by natural enemies. Descriptions of two new species of the genus Spalangia from northern Australia and the Soenda (Sunda) Islands, namely, *S. orientalis* reared from puparia of *L. exigua* and other Muscidae and *S. sundaica* reared from muscid puparia, are given in an appendix by L. F. Graham.

Information on Agria mamillata Pandellé (Diptera—Sarcophagidae) [trans. title], A. Servadei (*Bol. Lab. Ent. R. Ist. Super. Agr. Bologna, 4 (1931), pp. 73–76, pl. 1, figs. 2*).—The larvae attacking *Hyponomeuta padellus* L. on apple and hawthorn were found to be those of a sarcophagid, *A. mamillata*. A description is given of the grown larva, together with information on the biology and methods of dissemination of the parasite.

Observations on the behaviour of the sarcophagid fly, Wohlfahrtia vigil (Walk.), N. Ford (*Jour. Parasitol., 19 (1932), No. 2, pp. 106–111*).—This account of observations made during the summer of 1931 of the behavior of *W. vigil*, the larvae of which cause cutaneous myiasis in infants and young mammals, deals particularly with larviposition.

Fly strike of sheep: A natural phenomenon, F. G. Holdaway (*Jour. Council Sci. and Indus. Res.* [*Aust.*], *5 (1932), No. 4, pp. 205–211*).—"Evidence regarding the attraction of blowflies, the oviposition responses of the female flies, the development of the larvae, and the succession of flies in carcasses and on living sheep is cited in support of the contention that bacterial activity in wool is a forerunner to strike in much the same way as bacterial activity on the skin and in the hair of dead mammals is a forerunner to attraction of flies and development of larvae thereon."

A list of 31 references to the literature is included.

Some studies of the dipterous fauna of the poultry yard in Quebec in relation to parasitic troubles, A. D. Baker (*Poultry Sci., 12 (1933), No. 1, pp. 42–45*).—This paper presents the results of studies of the Diptera present in poultry yards in Quebec, members of which order of insects are considered to be the most noticeable and probably the most prevalent invertebrate forms present.

Observations on some parasites of Oscinella frit Linn., Part II, A. D. Imms (*Parasitology, 24 (1932), No. 3, pp. 440–447, figs. 2*).—In this continuation of the account previously noted (E. S. R., 63, p. 259), the author draws the following conclusions from observations made at Harpenden, England, during the years 1926 to 1930, inclusive:

"The extent of destruction of the stem generation of *O. frit* through the agency of parasites increases progressively with the normal advance of the season. When the host insect infected oats that were sown between February 28 and March 15, the mean percentage destroyed by parasites was 23. When the sowing dates of oats were between March 20 and April 25, the mean percentage of host insects destroyed by parasites was 43.5. The increase in intensity of parasitization appears to be correlated with an annual seasonal increase in the parasite population. Three species of primary parasites were

involved, viz, the cynipid *Rhoptromeris eucera* Htg., the proctotrypid *Loxotropa tritoma* Thoms., and the chalcid *Halticoptera fuscicornis* (Walk.). A fourth species of parasite, viz, the chalcid *Callitula bicolor* Spin., occurred in smaller numbers, and its status was undetermined. The possibility of its being a secondary parasite requires investigation. The species *C. bicolor* is recorded for the first time as a parasite of *O. frit*, and a detailed description of the insect is given."

Studies on the biology and control of the corn-seed maggot (Chortophila cilicrura Rond.) [trans. title], V. N. Rekach (Rekatch) (*Trudy Prikl. Bot., Genet. i Selek. (Bul. Appl. Bot., Genet. and Plant-Breeding), 26 (1931), No. 5. pp. 267–285, figs. 8; Eng. abs., p. 284, 285*).—This contribution from the Azerbaidzhan (Azerbaijan) Experiment Station, Gandzha, Transcaucasian S. F. S. R., Soviet Union, reports upon studies of the biology and control of a dipterous pest which has caused severe damage to cotton, leguminous plants, and the cereals. In 1926 the yield of cotton from heavily infested plantations was reduced by 42 per cent, due to larvae burrowing into the seeds and the roots of seedlings, and causing them to decay.

Progressive paralysis of the nervous system of house flies by formaldehyde and anesthetics, W. A. Hiestand (*Ind. Acad. Sci. Proc., 47 (1931), pp. 433–437*).—It is shown that formaldehyde, when ingested by the house fly, causes a progressive paralysis of the nervous system in an anterior direction, starting with the posterior end of the abdomen and ending with the mouth parts and antennae. Anesthetics, including chloroform, ether, and chloretone (chlorobutenol) produce results comparable to formaldehyde, although the phases of paralysis are not as distinct. In recovery from anesthesia the phases occur in the opposite direction, the anterior end recovering first and the progression being in a posterior direction.

Biological notes on Rhagoletis cerasi (L.) Loew (Diptera, Trypaneidae) [trans. title], G. M. Martelli (*Bol. Lab. Zool. Gen. e Agr. R. Ist. Super. Agr. Portici, 26 (1932), pp. 20–46*).—This is a report of studies of *R. cerasi*, made largely from April to June, 1931, at Bisceglie, in the Province of Bari.

The geographical distribution of the cherry fly Rhagoletis cerasi L., Dipt. [trans. title], M. Bezzi (*Bol. Lab. Zool. Gen. e Agr. R. Scuola Super. Agr. Portici, 20 (1927), pp. 7–16*).—This account of the occurrence of the cherry fly *R. cerasi*, which supplements a brief contribution on the pest[1], includes a list of 67 references to the literature.

Life history and control of the Asiatic garden beetle, H. C. Hallock (*U. S. Dept. Agr. Circ. 246 (1932), pp. 16, figs. 10*).—An account is given of the distribution, morphology of the several stages, life history and bionomics, economic importance, and control of *Autoserica castanea* Arr., first collected in this country in the summer of 1921 near Rutherford, N. J., and now known as the Asiatic garden beetle. The pest has increased and spread until at the close of the summer of 1931 it was found to occur at points extending from Virginia to the northern part of Connecticut. It is chiefly in the vicinity of New York City that injury has occurred to lawns and ornamental garden plants.

The beetle completes its life cycle in one year, spending about 10 months in the ground as a larva feeding on plant roots. Adults are present from late June to October and feed during warm nights on foliage and blossoms. The eggs, which are deposited in the ground, hatch and after passing through three larval instars and the pupal stage become adults the following year.

[1] Bol. Lab. Zool. Gen. e Agr. R. Scuola Super. Agr. Portici, 5 (1910), pp. 16–18.

In lawns where the beetle infestation is dense the larvae may be controlled by applying 35 lbs. of lead arsenate to 1,000 sq. ft. of lawn when the lawn is being built, and thoroughly cultivated to a depth of from 3 to 4 in. In the case of old lawns, protection can be secured by top-dressing with 15 lbs. of lead arsenate to 1,000 sq. ft. of lawn. The plants which are generally defoliated should be sprayed with 6 lbs. of coated lead arsenate to 50 gal. of water, or 3 lbs. of lead arsenate and 2 lbs. of wheat flour to 50 gal. of water. This spray should be applied not later than July 10.

Researches on the Colorado potato beetle in France (Leptinotarsa decemlineata Say) I, II [trans. title], J. FEYTAUD (*Min. Agr. [France], Ann. Épiphyties, 16 (1930), No. 6, pp. 303–390, pl. 1, figs. 21; 18 (1932), No. 2–3, pp. 97–220, pls. 4, figs. 15*).—Part 1 of this contribution reports upon biological studies and part 2 on means of control.

The control of a watercress leaf-beetle, Phaedon cochleariae, H. W. THOMPSON (*Welsh Jour. Agr., 8 (1932), pp. 233–236*).—A report is made of cases of severe injury to water cress in west Glamorgan, Wales, and south Monmouthshire, England, by *P. cochleariae*. "Control was obtained at one center by spraying the beds with suitable insecticides, derris and pyrethrum sprays being used. It was undesirable to use arsenical sprays. At a second center a large measure of control was obtained by flooding the beds, many of the beetles being washed away when the water was released."

The biology and feeding habits of Hyperaspis lateralis Mulsant (Coleoptera—Coccinellidae), H. L. MCKENZIE (*Calif. Univ. Pubs. Ent., 6 (1932), No. 2, pp. 9–20, pls. 2, figs. 4*).—This is an account of a ladybird beetle, native of the southwestern portion of the United States, having been found in California, Arizona, New Mexico, and Texas. Though it reproduces very slowly, it is apparently able to keep the native redwood mealybug, *Pseudococcus sequoiae* (Coleman), under control. Its feeding is confined almost entirely to various species of mealybugs. Under laboratory conditions, the life cycle required about 53 days in the fall and at least 35 days in the spring.

The Coccinellidae, their protective secretions, resemblances, and natural enemies, I, II [trans. title], F. HEIKERTINGER (*Biol. Zentbl., 52 (1932), Nos. 2, pp. 65–102, figs. 11; 7, pp. 385–412*).—Part 1 of this contribution deals with protective secretions and resemblances and part 2 with the natural enemies of coccinellids.

Immature stages of Indian Coleoptera.—11, Platypodidae, J. C. M. GARDNER (*Indian Forest Rec., 17 (1932), No. 3, pp. 10, pls. 2*).—This is in continuation of the contributions previously noted (E. S. R., 67, p. 580).

The control of wireworms under glass, H. W. MILES (*Jour. Min. Agr. [Gt. Brit.], 39 (1932), No. 4, pp. 353–358*).—It is concluded that when wireworms are present in large numbers in the soil in glasshouses newly erected on recently broken grassland, the method of baiting with germinating seeds, followed by the use of calcium cyanide, offers a fairly simple and reliable means of control.

The effect of atmospheric humidity on the metabolism of the fasting mealworm (Tenebrio molitor L., Coleoptera), K. MELLANBY (*Roy. Soc. [London], Proc., Ser. B, 111 (1932), No. B 772, pp. 376–390, fig. 1*).—The loss in weight of starving yellow meal worms under controlled conditions of temperature and humidity was studied by the author. Analyses of the insects before and after starvation were made with a view to showing what food reserves were used. It was found that the yellow meal worm used mainly fat, and in addition some carbohydrate (principally glycogen) and protein.

Pin-hole borers of the walnut bean (Endiandra palmerstoni), J. H. Smith (*Queensland Agr. Jour., 38 (1932), No. 3, pp. 229–246, figs. 6*).—Studies are reported of pinhole damage to heartwood in the walnut bean (*E. palmerstoni*), which during recent years has assumed importance as a source of wood for veneer manufacturing, especially in America. The species *Crossotarsus grevilleae* Lea, a minute platypodid, which is mainly responsible for the injury, is found associated with *Xyleborus hirsutus* Lea.

Control of root weevils on Taxus and other nursery plants, W. D. Whitcomb (*Natl. Nurseryman, 39 (1931), No. 11, pp. 5, 6, fig. 1*).—The larvae of the strawberry root weevils, *Brachyrhinus ovatus* and the black vine weevil, both primary pests of strawberries causing much damage to this crop in some sections, particularly in the Northwest, are reported by the Massachusetts Experiment Station as attacking roots of the Japanese yew (*T. cuspidata*) in nurseries in New England. Occasionally 50 per cent or more of the nursery plantings of Taxus have been infested and injured, as well as isolated specimens in ornamental plantings. The black vine weevil was found to be the most important on Taxus, but also attacks many other plants in the nursery, including retinispora, rhododendron, ampelopsis, hemlock, spirea, and wistaria, as well as sorrel, grasses, and clover. In the greenhouse it is an important pest of cyclamen and is reported attacking gloxinia, primroses, ferns, and tuberous begonias.

Experiments have shown that soil treatment, even with such effective materials as carbon disulfide emulsion and pyrethrum soap emulsion, are not as satisfactory and practical as would reasonably be expected. Poisoned fruit baits have proved effective in a few trials on infested Taxus plants in the East and have been very successfully employed in strawberry plantations in the Northwest. A satisfactory homemade bait has been made by soaking 10 lbs. of raisins in water for 2 hours, followed by draining and the addition of 1 lb. of sodium fluosilicate or calcium arsenate with vigorous stirring, etc. Ten lbs. of shorts or bran are then mixed with the poisoned raisins and put through a food or meat chopper. A very satisfactory commercial bait on the market consists of dried apple and poison. The bait should be applied when the weevils emerge from the soil, which is about the time that the native strawberries are ripe, or approximately June 15 in Massachusetts. A small handful of bait should be placed near the trunk of each tree, and if the weevils are numerous a second application about two weeks later is advisable.

Brown vegetable weevil now attacking tomatoes and potatoes (*Agr. Gaz. N. S. Wales, 43 (1932), No. 10, p. 782*).—A note on the vegetable weevil, which attacks the tomato, potato, and most vegetable crops and breeds in many weeds.

Control of the white pine weevil, J. S. Boyce et al. (*Jour. Forestry, 30 (1932), No. 7, pp. 800–804*).—This is a committee report on the white pine weevil situation in the New England States.

A new barine curculionid injurious to sugarcane in Louisiana, with synopses of Anacentrinus and Oligolochus (Coleop.), L. L. Buchanan (*Ann. Ent. Soc. Amer., 25 (1932), No. 2, pp. 328–336, figs. 4*).—Under the name *A. subnudus* the author describes a new species which attacks sugarcane in Louisiana, and gives a key for the separation of species of the genus Anacentrinus here erected.

Sugarcane rootstock weevils, W. E. Hinds and B. A. Osteberger (*Ann. Ent. Soc. Amer., 25 (1932), No. 2, pp. 337–342, pl. 1*).—In this contribution from the Louisiana Experiment Station the authors deal with the rootstock weevils of sugarcane, particularly *Anacentrinus subnudus*, above described by Buchanan

as representing a new species, and *A. deplanatus*, which is the most commonly known species of this genus, extending from Louisiana to Missouri and Kansas at least. Both are of economic importance. The name brown rootstock weevil is proposed for the former and black rootstock weevil for the latter.

New encyrtid (hymenopterous) parasites of a Pseudococcus species from Eritrea, H. COMPERE (*Calif. Univ. Pubs. Ent., 5 (1931), No. 14, pp. 265–274, figs. 3*).—Three species are here described as new, two of which represent the newly erected genera Tropidophryne and Neodiscodes.

The Encyrtinae of Japan.—II, Studies on morphology and biology, T. ISHII (*Bul. Imp. Agr. Expt. Sta. Japan, 3 (1932), No. 3, pp. 161–202, pls. 8*).—This second contribution on the Encyrtinae (E. S. R., 62, p. 861) deals with their morphology, biology, and economic importance, in connection with a list of 68 references to the literature.

Notes on the biology and morphology of Athalia colibri Christ. and two of its parasites [trans. title], G. M. MARTELLI (*Bol. Lab. Zool. Gen. e Agr. R. Ist. Super. Agr. Portici, 26 (1932), pp. 313–333, figs. 9*).—A report of observations of the sawfly enemy of rape, *A. colibri*, in the vicinity of Taranto and of two of its parasites, the chalcidid *Perilampus italicus* Fab. and the tachinid *Meigenia mutabilis* Fall.

Progress of Trichogramma parasitism in borer eggs, 1932 examinations, W. E. HINDS, B. A. OSTERBERGER, and A. L. DUGAS (*Sugar Bul., 11 (1932), No. 1, p. 7*).—In this contribution from the Louisiana Experiment Stations (E. S. R., 67, p. 156), information is given on the percentage of sugarcane borer eggs destroyed by Trichogramma as determined in about 75 fields at intervals of about two weeks. Commencing June 13 to 17 the parasitism by *T. minutum* increased in colonized, adjacent, and check crops from 11.3, 3.3, and 6.9 per cent, respectively, to 96.3, 93.2, and 70.6, respectively, September 6–10.

Agriotypus armatus (Walk.) (Hymenoptera) and its relations with its hosts, K. FISHER (*Zool. Soc. London, Proc., 1932, II, pp. 451–461, figs. 8*).—An account of a hymenopterous parasite, aquatic in habit and parasitic on Trichoptera or caddis flies of the genus Silo (*S. pallipes*).

Two undescribed chalcid parasites of the woolly whitefly, Aleurothrixus floccosus (Maskell), from Haiti, H. L. DOZIER (*Ent. Soc. Wash. Proc., 34 (1932), No. 7, pp. 118–122*).—*Encarsia haitiensis*, reared from a woolly white fly (*A. floccosus*) on *Spondias mombin*, and *Euderomphale aleurothrixi*, reared from *A. floccosus* on *Guajacum officinale*, are described as new. Both parasites are from Haiti.

The identity of certain whitefly parasites of the genus Eretmocerus Hald., with descriptions of new species (Hymenoptera: Aphelininae), H. L. DOZIER (*Ent. Soc. Wash. Proc., 34 (1932), No. 7, pp. 112–118, fig. 1*).—Of the five species of Eretmocerus here considered which parasitize white flies, three are described as new, namely, (1) *E. illinoisensis*, collected near Elizabethtown, Ill., (2) *E. portoricensis*, an abundant and effective parasite of a woolly white fly (*Aleurothrixus floccosus* Mask.) in Puerto Rico, and (3) *E. pallidus*, reared from *Tetraleurodes* n. sp. on *Annona squamosa* at Port-au-Prince, Haiti.

Oklahoma spiders, N. BANKS, N. M. NEWPORT, and R. D. BIRD (*Okla. Univ. Biol. Survey Pubs., 4 (1932), No. 1–2, pp. 7–49, figs. 7*).—This account includes an annotated list of Oklahoma spiders, with records of their occurrence (pp. 12–34).

Notes on a venomous spider in the Philippines (Lâtrodectes sp. near hasselti Thorell), F. Q. OTANES (*Philippine Jour. Agr., 3 (1932), No. 2, pp. 83–*

89, pls. 2).—This account includes suggestions as to remedies for the bites of and as to methods of control of this spider.

Studies of the anatomy of the pajaroello tick, Ornithodorus coriaceus Koch.—I, The alimentary canal, G. H. True, jr. (*Calif. Univ. Pubs. Ent., 6 (1932), No. 3, pp. 21–48, pls. 3, figs. 17*).—Studies of the gross and microscopic anatomy of the digestive tract of *O. coriaceus* are reported upon.

The bionomics of Ixodes ricinus L., the "sheep tick" of Scotland, J. Macleod (*Parasitology, 24 (1932), No. 3, pp. 382–400, figs. 5*).—A report of studies of the life history and bionomics of the castor-bean tick, which is recognized as the major scourge of farm stock in Great Britain and which in England and northern Europe is a vector of a small piroplasm causing red water in cattle. It is pointed out that recent investigations by the author (E. S. R., 68, pp. 252, 531) have shown it to transmit the virus of louping-ill, a widespread disease of sheep in Great Britain.

A study of the ticks in Kenya Colony: The influence of natural conditions and other factors on their distribution and the incidence of tick-borne diseases—Part II, E. A. Lewis (*Kenya Colony Dept. Agr. Bul. 6 (1932), pp. 33, pl. 1*).—This second part (E. S. R., 67, p. 294) reports upon an investigation into the tick problem in the Rift Valley (continued), the Uasin Gishu, and the Trans Nzoia districts, Kenya Colony.

A species of Neoaplectana Steiner (Nematoda—Oxyuridae) parasitic on Conorhynchus (Cleonus) mendicus Gyll. (Coleoptera—Curculionidae) [trans. title], L. Travassos (*Bol. Lab. Zool. Gen. e Agr. R. Ist. Super. Agr. Portici, 26 (1932), pp. 115–118, figs. 2*).—A description is given with notes on the nematode *N. menozzii* n. sp., a parasite of the larva, pupa, and adult of *C. mendicus*, a serious weevil enemy of the sugar beet in Italy.

ANIMAL PRODUCTION

[Experiments with livestock] (*Arizona Sta. Rpt. 1932, pp. 79–82, 126–130*).—Progress results of studies are reported on a comparison of rations for steers in the Salt River Valley, harvesting hegari stalks by the use of steers, and a comparison of rations for lambs in the Salt River Valley, all by E. B. Stanley and E. L. Scott.

In poultry work information is reported on housing v. no-housing, the effect of inbreeding and outcrossing on egg production, a comparison of horse-meat meal and Manamar, rearing chicks in confinement, and utilizing barley and red milo by feeding to poultry, all by H. Embleton.

[Experiments with livestock in Michigan] (*Michigan Sta. Bien. Rpt. 1931–32, pp. 8–12, 22, 47*).—This report includes data on a comparison of western range lambs and native lambs in the feed lot, heifer calves v. steer calves for beef, the value of grinding grain for fattening pigs, alfalfa v. tankage as a protein supplement for breeding gilts, a study of slipped tendon or hock disease of chickens, and artificial heat for poultry houses.

[Experiment with livestock in Montana] (*Montana Sta. Rpt. 1931, pp. 49, 50, 51–53, 98–107, figs. 5*).—Experiments with beef cattle include studies on the value of alfalfa hay and small grains for fattening yearling steers, baby beef production, wintering beef cows, levels of wintering growing heifers, and investigations in managing a beef herd.

The sheep studies were made up of a comparison of rations for finishing lambs, the value of wet beet pulp in fattening rations, the addition of cottonseed cake or beet molasses to pulp rations, a comparison of grains when fed with pulp and alfalfa, and the relation of type of ewe to production.

In the hog work results are reported on a comparison of wheat and barley for fattening hogs, the value of tankage when added to wheat or barley, tankage and bone meal as supplements to a barley-rye and alfalfa hay ration, a comparison of wheat with northern Montana rye and barley and rye mixtures for pigs, hogging down corn, and a comparison of bacon- and lard-type hogs.

Other studies with livestock include experiments on the production and management of purebred and grade draft and light horses under range conditions and raising and growing turkeys.

[Investigations with livestock in South Carolina] (*South Carolina Sta. Rpt. 1932, pp. 40–42, 43, 93–98, 101, 102, fig. 1*).—In swine studies results are reported of tests of rations for fattening hogs on green barley, a comparison of green rye and barley as forages for fattening hogs, and cottonseed meal as a supplement to corn for hogs on green pasture, all by E. G. Godbey; a study of the influence of soybeans on the hardness of fat in hogs when fed with limited and full rations of corn and corn and fish meal, by Godbey and L. V. Starkey; winter forage supplements for fattening hogs and summer forage crops for hogs and their effect on rate and economy of gain and hardness of fat, by E. D. Kyzer and T. N. Clyburn.

The results with poultry include data as to the use of vegetable proteins in laying and breeding rations, value of various forms of dried milk in a standard meat scrap laying ration, value of dried whey in a standard meat scrap laying ration, ground oats v. ground yellow corn in the laying ration, dicalcium phosphate as a mineral supplement to a standard meat scrap laying ration, green feed v. alfalfa leaf meal as supplements to the laying mash, value of cod-liver oil in laying and breeding rations, growth rate of chicks, and commercial cold storage of eggs, all by C. L. Morgan and L. W. Smith; and yellow corn v. white corn in chick rations, by Smith.

Results obtained in a test of a method for shortening the winter feeding period for purebred beef cows by the use of Bermuda grass pasture, by Starkey, are briefly reported.

[Experiments with livestock in South Dakota] (*South Dakota Sta. Rpt. 1932, pp. 10, 11, 25–27*).—Preliminary information is reported on the value of ground flax and ground soybeans in the production of baby beef, methods of feeding lambs, feeding alfalfa screenings with grains and hay to lambs, and fattening summer pigs on South Dakota grains, all by J. W. Wilson.

In studies with poultry results are reported on the feeding values of wheat and wheat by-products, and comparative metabolism of several calcareous materials in poultry feeding, both by W. C. Tulley.

[Investigations with livestock] (*Washington Col. Sta. Bul. 275 (1932), pp. 18–23, 24, 25, 50, 51, 58*).—Preliminary results of studies with beef cattle include data as to feed requirements for fattening calves, yearlings, and 2-year-olds for Pacific Coast markets, and wheat hay v. alfalfa hay as a feed for 2-year-old steers, by H. Hackedorn and R. McCall.

The sheep studies report results as to fattening lambs on whole grains, processing wheat, oats, and barley, and comparative values of corn silage, cull potatoes, and cull apples, all by Hackedorn, H. P. Singleton, and J. Sotola; the biological value of proteins in alfalfa leaves and stems and digestion coefficients of nutrients in stems and leaves, and the effect of plant maturity on the nutritive value of Markton oat hay, by Sotola; steam-rolled barley for pregnant ewes, by Sotola and Hackedorn; and the nutritive value of range grasses, by McCall.

The work with poultry presents results on the protein requirements of poultry and the biological value of proteins, by J. L. St. John, O. Johnson, C. Kempf, V. Hefty, J. S. Carver, and D. Brazie; sardine oil as a source of vitamin D

for growing chicks, by Carver; and the vitamin D requirements of growing chicks and laying hens, by Carver, Brazie, and E. I. Robertson.

[Experiments with livestock] (*West Virginia Sta. Bul. 254 (1932), pp. 25–28, 29, 30, 54, 55, fig. 1*).—Progress data of experiments with beef cattle include the value of grain supplements for steers on pasture, finishing calves for market, herd management for the production and slaughter of feeder calves, and finishing 2-year-old steers on grass and grain.

Studies with sheep and hogs include results on Corriedale top crosses for increasing wool production and protein supplements for finishing hogs in dry lot.

In the work with poultry data are given as to factors affecting the weight of hens' eggs, the time interval between cycles as an index of annual production, and frequency of turning eggs during hatching.

Analyses showing the variability of different bones of the body in moisture content and ash are also discussed.

[Studies with livestock in Wyoming] (*Wyoming Sta. Rpt. 1932, pp. 15–17, 20, 34, 35, 36, 37, 39–41, 42*).—In tests with sheep, data are reported on crossbred lambs from grade Rambouillet ewes, a comparison of rations for wintering lambs at the Eden Substation, and a comparison of rations for fattening lambs at the Torrington and Worland Substations.

Other studies yielded information on the phosphorus content of alfalfa from land treated with calcium phosphate, the value of corn, ground wheat, and ground barley for fattening pigs at the Gillette Substation, and the comparative efficiency of pullets and yearling hens for egg production at the Lyman Substation.

A comparative study of rabbits maintained on barley or alfalfa, F. Bischoff, W. D. Sansum, M. L. Long, and R. D. Evans (*Jour. Nutrition, 5 (1932), No. 4, pp. 403–411*).—In this study no significant change was found in the plasma hydrogen-ion concentration or carbon dioxide content of the blood of rabbits maintained for nearly two years either on a barley diet or on an alfalfa diet. The urinary acidity ranged from pH 5.2 to 6.2 for the barley group and from pH 8.2 to 9.5 for the alfalfa group. There was no evidence of pathological changes in the seven rabbits maintained on alfalfa, but early death with unmistakable evidence of a diet efficiency was noted for the barley rabbits. In the latter group a fatty change of the liver was noted in three rabbits and a focal diffuse nephritis in one rabbit.

Saline and alkaline drinking waters, V. G. Heller (*Jour. Nutrition, 5 (1932), No. 4, pp. 421–429*).—Rats fed a well-balanced ration at the Oklahoma Experiment Station were given distilled water for drinking purposes to which was added varying amounts of salts until the deleterious level was reached.

Within 10 days after the start of the study no animals were alive in lots receiving 2.5 per cent or more of sodium chloride in their water. The effect produced seemed to be more osmotic in reaction than due to any specific ion. Animals refused to drink the high concentrate waters until thirst compelled them to drink large quantities at one time, which caused death in a short interval. From 1.5 to 1.7 per cent appeared to be the maximum amount of soluble salt that could be safely used. Animals apparently were less susceptible to salt solutions than plants.

Chloride salts were less injurious than sulfates, and organic salts were less injurious than inorganic. Alkalies, probably due to the osmotic effect coupled with the harmful effect of the changed pH, were more harmful than normal salts. The deleterious effect on lactation and reproduction was noticeable even before the level causing stunted growth or death was reached.

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Commercial feeding stuffs, 1931–32, J. M. Bartlett (*Maine Sta. Off. Insp. 144 (1932), pp. 17–64*).—The usual report of analyses of 1,053 samples of feeding stuffs collected for official inspection for the year ended June 30, 1932 (E. S. R., 66, p. 355).

Inspection of commercial feedstuffs, P. H. Smith et al. (*Massachusetts Sta. Control Ser. Bul. 64 (1932), pp. 48*).—The usual report of the chemical and microscopical analyses of 1,607 samples of feeding stuffs collected for official inspection during the year ended September 1, 1932 (E. S. R., 66, p. 457).

Swedes versus potatoes for beef production, W. G. R. Paterson (*Highland and Agr. Soc. Scot. Trans., 5. ser., 43 (1931), pp. 86–99*).—A study was conducted at the West of Scotland Agricultural College to determine whether potatoes could be used to replace swedes in whole or part without affecting the cost of feeding cattle or adversely affecting the quality of the meat. Three lots of six animals made up of three blue-gray (Shorthorn × Galloway) and three Galloway steers each were fed the same ration except for the two feeds being compared. Lot 1 received swedes; lot 2, equal parts on a dry-matter basis of swedes and potatoes; and lot 3, potatoes furnishing the same amount of dry matter as the swedes fed in lot 1. The average daily gains in the respective lots were 1.8, 1.9, and 1.9 lbs. per head.

These results show that potatoes can successfully replace swedes, and when fed on an equivalent dry-matter basis the return per ton of potatoes was approximately three times that of swedes. This method of utilizing potatoes offered an economical means of disposing of a surplus. In the amounts fed the potatoes had no adverse effect on the quality of the beef. The blue-gray steers made somewhat more rapid gains than did the Galloways, but there was no marked difference in the yield of carcasses in the two kinds of cattle.

Dryland fattening rations for lambs, G. E. Morton, H. B. Osland, and J. F. Brandon (*Colorado Sta. Press Bul. 80 (1932), pp. 12, fig. 1*).—Continuing these tests (E. S. R., 68, p. 514), 11 lots of 20 lambs each, averaging approximately 58.7 lbs. per head, were fed for 128 days. A simple mineral mixture and salt were fed to all lots. Lots 1 to 6, inclusive, received shelled corn and cottonseed cake, and lots 7 to 11, inclusive, were fed ground hog millet and cane fodder. In addition the respective lots received ground thistles, cut cane fodder, whole cane fodder, immature millet hay, mature millet hay, bean straw, cottonseed cake and Sudan grass meal, cottonseed cake, ground flaxseed, ground soybeans, and linseed cake. The average daily gains in the respective lots based on the market weights were 0.2, 0.2, 0.2, 0.3, 0.2, 0.3, 0.2, 0.3, 0.2, 0.2, and 0.2 lb. per head.

Hog millet was worth 90 per cent as much as shelled yellow corn, but had to be ground in order for lambs to handle it efficiently. Grinding cane fodder did not increase the rate or economy of gains, but did decrease the amount of waste. Ground thistles had approximately 105.4 per cent the fattening value of ground cane fodder and 93.9 per cent the value of cane fodder. Immature millet hay was worth 107.3 per cent and mature millet hay 98.4 per cent as much as whole cane fodder. In this test bean straw showed 112.9 per cent the feeding value of whole cane fodder. Cottonseed cake produced slightly greater and more economical gains than linseed cake. Ground flaxseed did not produce as large gains as either cottonseed cake or linseed cake, nor were the gains produced so cheaply as with cottonseed cake. Ground soybeans proved to be worth approximately two-thirds as much as cottonseed cake.

Lamb-fattening experiments in Utah, E. J. Maynard, A. C. Esplin, and S. R. Boswell (*Utah Sta. Bul. 238 (1932), pp. 44, figs. 13*).—A series of lamb-feeding tests was undertaken to demonstrate means of utilizing and marketing

surplus feed to best advantage. These tests were conducted for a period of 4 years at Monroe and for 1 year at Delta.

In the work at Monroe it was found that while barley and alfalfa made an excellent basal ration for fattening lambs, supplemental feeds materially increased gains and reduced feed costs. Alfalfa hay of the first and second crop cut at the tenth bloom stage was practically equal in feeding value, while third-crop alfalfa cut at the bud stage was worth approximately 30 per cent more than the other crops. There were some advantages in feeding first-crop alfalfa during the early part of the feeding period and second-crop hay during the later part. Brown-cured alfalfa was more palatable and proved to be worth slightly more than green-cured hay of the same cutting. Although barley and wheat produced practically the same gain, 88.5 per cent of the wheat-fed lambs were fat as compared with 77 per cent of the barley-fed lambs. Barley when fed with alfalfa had 84.4 per cent the feeding value of shelled corn. Sugar beet molasses was equal in value to grain, as each ton fed replaced 944 lbs. of barley, 2,636.4 lbs. of alfalfa, and 38.6 lbs. of salt. The addition of beet molasses increased the number of fat lambs by 19 per cent and also aided in avoiding digestive disturbances. When fed at a rate not exceeding 1.5 lbs. daily with a ration of barley and alfalfa, corn silage was worth about one-half as much as alfalfa hay per ton. Adding cottonseed meal to a barley-alfalfa ration increased the gain and finish, and each ton of meal fed replaced 1,490.8 lbs. of whole barley, 3,514.5 lbs. of alfalfa, and 52.1 lbs. of salt. Ground barley had a distinctly lower feeding value than whole barley. Wrinkly lambs made comparable gains at a comparable cost with smooth lambs, but because of the heavier pelts had lower dressing percentages, and for this reason a slight price discrimination might be justified. Thrifty, small young lambs made slightly smaller but more efficient gains than larger older lambs.

The results at Delta showed that lambs were fattened on an average ration of 15.4 per cent of barley and 84.6 per cent of alfalfa as compared with a 3-year average at Monroe of 32 per cent barley and 68 per cent alfalfa. The usual relationship between shelled corn and whole barley was secured in these trials. Adding cottonseed meal or a commercial protein concentrate increased the feed cost per unit of gain but did not increase the gains. Alfalfa chaff and barley straw produced low gains when fed without alfalfa hay. Cottonseed meal was more efficient than a commercial protein concentrate when fed with grain and alfalfa chaff. Recut alfalfa hay was less valuable than whole alfalfa. There was no significant difference in the rate or economy of gains of wrinkly and smooth-pelted lambs of the same breeding.

Effect of feed, water, and shelter upon fleeces of Utah ewes, A. C. Esplin (*Utah Sta. Bul. 240 (1932), pp. 26, figs. 5*).—Fleeces from range-bred ewes wintered on desert ranges were compared with fleeces from ewes of the same breeding wintered under farm conditions, involving regular feeding, shelter, and free access to water. A total of 462 fleeces collected during five shearing seasons was used for comparison. The fleeces were weighed and sampled at the shearing corral, and in the laboratory records were kept on grease weight, scoured weight, scoring of fleece, measurement of staple from six parts of the fleece, score of fleece condition, and grade of fleece.

Station-fed ewes on the average produced heavier grease weight fleeces than range-fed ewes, although during a 3-year period range fleeces in grease were slightly heavier. The shrinkage of range fleeces was appreciably greater, the difference in favor of the station-fed ewes averaging 0.6 lb. for 3 years, and 2 lbs. for 2 years. During the entire experiment the station-fed ewes averaged

80 per cent strictly combing fleeces, 19.5 per cent French combing, and 0.5 per cent clothing. Range ewes showed 73 per cent strictly combing, 26 per cent French combing, and 1 per cent clothing fleeces. The mean staple length for both sets of ewes was 2.5 in. In the grease the fleece weights averaged 10.6 and 9.6 lbs. for the station-fed and range ewes, respectively. Length of fiber and clean weight were closely correlated, and in fine wool increased length increased both fleece weight and quality. The station-fed ewes produced brighter fleeces than the range ewes. The latter fleeces showed considerable vegetable matter and an unnecessarily large amount of branding paint. The fleeces produced during the first 3 years were largely of fine-wool grade, while some medium-grade wool was produced during the last 2 years.

The economy of washing Kent sheep before shearing, N. L. Tinley (*Jour. Min. Agr.* [*Gt. Brit.*], *38 (1931), No. 2, pp. 151–154*).—In studies covering a period of five years the South-Eastern Agricultural College at Wye, Kent, determined that when a sheep grower had a total of 1,000 lbs. of grease ewe wool per year there was an increase in the value of the wool due to washing the sheep before shearing. With yearling wethers washing caused a decrease in body weight that more than offset the increased value of the wool.

The basic amino acids of wool, A. M. Stewart and C. Rimington (*Biochem. Jour., 25 (1931), No. 6, pp. 2189–2192*).—An analysis to determine the basic amino acids present in the fleece of a 2-year-old Western Australian merino ewe was made by the Wool Industries Research Association, Leeds, according to Calvery's method (E. S. R., 63, p. 414). This wool contained 0.55 per cent of histidine, 6 per cent of arginine, and 2.2 per cent of lysine.

The dentition of the pig, O. C. Bradley (*Highland and Agr. Soc. Scot. Trans., 5. ser., 44 (1932), pp. 111–129, figs. 14*).—A study was made at the Royal Veterinary College, Edinburgh, to determine whether the teeth of the pig could be used as an indication of age.

The period of eruption of the five lower teeth that normally appear before one year of age were found to be approximately as follows: First true molar, from 15 to 26 weeks; first premolar, 16 to 42 weeks, and frequently the tooth was absent; third or corner incisor, 27 to 40 weeks; canine or tusk, 34 to 52 weeks; and second true molar, from 40 to 49 weeks.

The period of eruption for the various teeth appeared to be of such length that the use of dentition as an accurate and satisfactory guide to the age of the pig could not be relied upon.

The body fats of the pig.—I, Influence of ingested fat on the component fatty acids, R. Bhattacharya and T. P. Hilditch (*Biochem. Jour., 25 (1931), No. 6, pp. 1954–1964*).—Specimens of the back fats and leaf fats from three lots of pigs that had been fed a basal ration consisting of barley meal, flaked maize, soybean meal, and dried yeast were analyzed at the University of Liverpool. One lot of pigs received the basal ration only, another lot received in addition 3 per cent of shea butterfat, while the third lot was fed 3 per cent of arachis oil in addition to the basal ration.

There was a tendency toward approximate constancy in the molecular content of the C_{18} acids in spite of variation in the total proportion of saturated and unsaturated acids in the diet. An increase in saturation of body fats was usually produced by an increase of stearic acid and a corresponding decrease in oleic acid. The outer layer of back fat differed in each case from that of the inner layer, while the latter layer was intermediate in type between the outer layer and the leaf fat but more closely resembled the latter. The outer layer was more unsaturated than the other specimens, but the feeding of arachis oil reduced the difference between these fatty deposits. The body fats from the

animals fed shea butter were not greatly different from those of the animals fed the basal ration, but adding arachis oil definitely increased the unsaturation in the stored fat and increased the proportion of linoleic acid in the unsaturated acids. The data also show that much of the deposited fat of the pig must be derived from carbohydrates and other nonfatty parts of the feed.

Fattening rations for hogs, G. E. Morton, H. B. Osland, and J. F. Brandon (*Colorado Sta. Press Bul. 81 (1932), pp. 15, fig. 1*).—Continuing these tests (E. S. R., 66, p. 658), 10 lots of 7 pigs each, averaging 72.5 lbs. per head, were fed for 90 days. A simple mineral mixture and salt were fed to all lots. A protein supplement made up of tankage and cottonseed meal 2:1 was fed in lots 1 to 4, inclusive, and lots 4 to 10, inclusive, received ground hog millet. In addition lot 1 received shelled corn; lot 2, ground barley; lot 3, cracked wheat; lot 5, a mixture of equal parts of tankage and cottonseed meal; lot 6, a protein mixture of tankage, cottonseed meal, and alfalfa meal 2:1:1; lot 7, tankage; lot 8, a protein mixture of tankage and ground flaxseed 2:1; lot 9, ground soybeans; and lot 10, ground flaxseed. The average daily gains in the respective lots, based on market weights, were 1.6, 1.4, 1.4, 1.6, 1.7, 1.7, 1.6, 1.8, 1.3, and 0.9 lb. per head.

In this test barley had 90.9 per cent the feed value of corn, and carcass studies showed no apparent difference between the two lots of pigs. However, the barley-fed pigs dressed somewhat higher than the corn-fed pigs. In the feed lot cracked wheat was equal to shelled corn, and the dressing percentage of wheat-fed hogs was higher than that of corn-fed animals. Millet proved to have 97 per cent the feed value of corn, and the carcasses of pigs fed this grain were fully equal to those of pigs fed corn.

A comparison of tankage and a mixture of tankage and cottonseed meal 2:1 showed that the mixture had 89.5 per cent the feeding value of tankage, but its market cost was only 87.6 per cent that of tankage. A mixture of equal parts of tankage and cottonseed meal had a feed replacement value practically equal to that of tankage, and it cost only 80 per cent as much as tankage. The mixture of tankage, cottonseed meal, and alfalfa meal was worth 88.1 per cent as much as tankage in feed value, but actually cost only 75.7 per cent as much. In this test ground flaxseed as the sole protein supplement had a value far below production cost, and the carcasses of pigs from this lot were very soft and had yellow fat. The lot fed the flaxseed mixture made the largest gains in this test, and the carcasses from this lot were as firm and white as those from the tankage-fed lots. The pigs fed soybeans made only fair gains, did not show the bloom or finish apparent in the other lots, and their carcasses were soft and flabby.

Feeding wheat to fattening hogs, B. E. Carmichael (*Maryland Sta. Bul. 336 (1932), pp. 113–154, figs. 15*).—A series of four trials, involving a total of 159 pigs, was undertaken to obtain information concerning the feeding value of wheat for hogs.

Ground wheat was more palatable, produced larger and more economical gains, and was worth from 5 to 10 per cent more than shelled corn. While a mixture of ground wheat and shelled corn equal parts was superior to shelled corn alone, it was less efficient than ground wheat alone. Allowing pigs on a ground wheat and mineral ration access to mixed grass pasture for 30 minutes daily slightly increased feed consumption and brought about 8 per cent larger gains at a saving of 7 per cent in feed required per unit of gain. Continuous access to alfalfa, alsike, and rape pasture, together with a ration of ground wheat and minerals, increased feed consumption 34 per cent, rate of gain 110 per cent, and effected a saving in feed requirements per unit of gain

of 36 per cent. When 0.2 lb. of fish meal daily was added to the above ration, feed consumption increased 57 per cent, rate of gain increased 158 per cent, and feed required per unit of gain decreased 39 per cent. The addition of fish meal was more efficient when used as a supplement to the ration of young 64-lb. pigs than when given to well-grown 140-lb. pigs. Adding 0.3 lb. of fish meal to a dry-lot ration of ground wheat and minerals increased feed consumption 51 per cent, rate of gain 130 per cent, and decreased feed required per unit of gain 34 per cent. When ground wheat was fed, less fish meal or minerals were required to produce the same amount of gain as when shelled corn was fed. Supplementing ground wheat and minerals with a protein concentrate or pasture or both increased the efficiency of the ration. Whole wheat was more palatable than either ground wheat or shelled corn, but 10 per cent more feed per unit of gain was required when whole wheat was fed instead of ground wheat and 9 per cent more when fed in place of shelled corn. Ground wheat was fully as suitable for use during a moderately long feeding period as shelled corn. Wheat damaged by insects could be ground and used to good advantage.

[Work and publications relating to poultry and eggs by the U. S. Department of Agriculture] (*U. S. Egg and Poultry Mag., 38 (1932), No. 8, pp. 20–29, 30, 31, 34, 35, 57, 58, figs. 11*).—This series of articles comprises the following: Work of the Animal Husbandry Division of the Bureau of Animal Industry in the Field of Poultry Investigations (pp. 20–29), which reviews poultry investigations completed and in progress and indicates desirable extensions; Publications Relating to Poultry and Eggs Written by Members of the Animal Husbandry Division, B. A. I. (pp. 30, 31, 57, 58), which lists the published scientific papers and popular articles by members of the division; Eggs in Nutrition (p. 34), which indicates the investigations in the Bureau of Home Economics that relate to eggs in human nutrition; and Work on Eggs in the Food Research Division of the Bureau of Chemistry and Soils (p. 35), in which investigations partially or wholly completed are reviewed, the publications of the bureau are listed, and desirable extensions of its work are indicated.

Effect of modifying the Ca-P ratio of a specific ration for growing chicks, F. E. Mussehl and C. W. Ackerson (*Poultry Sci., 11 (1932), No. 5, pp. 293–296, figs. 2*).—The Nebraska Experiment Station undertook a series of two experiments to obtain more information on the calcium-phosphorus ratio as it affects the growth of chicks. In the first series three lots of 46 heavy-bred chicks each were used, while in the second series five lots of 35 White Leghorn chicks each were used. In the first series the basal ration had a calcium-phosphorus ratio of 1:0.9, and this ratio was varied by the addition of calcium carbonate to 2:1 and by the addition of disodium phosphate to 1:2. In the second series the first three lots were similarly fed, while in the two additional lots enough monosodium phosphate and monoammonium phosphate, respectively, were added to give a calcium-phosphorus ratio of 1:2.

With the ration used and under the conditions of this test, normal calcification and bone development occurred in the lots receiving the basal ration. In no case did the addition of calcium carbonate depress the growth rate, but it had no beneficial effect as revealed by the growth rate and by bone-ash data. Relatively large amounts of the phosphate salts used in this study were tolerated by the growing chick, but the depressed growth rate indicated that the salts altered the normal physiological processes. The relatively high ash content of the bones of chicks receiving the high phosphorus rations showed that the slow growth rate was not due to a rachitic condition. The variation in

the growth rates of the lots receiving the various phosphate salts showed that some factor other than the calcium-phosphorus ratio was exerting a marked physiological effect.

A study of leg-bone deformities in growing chicks.—I, Deformities produced by high mineral rations, M. C. Herner and A. D. Robinson (*Poultry Sci., 11 (1932), No. 5, pp. 283–288*).—A crippled condition characterized by digestive disturbances, followed by thick hocks, bowlegs, short shanks, twisted legs, and slipped tendons developed in the course of several chick-feeding experiments at the University of Manitoba. These abnormalities were permanent and occurred in spite of care taken to insure an antirachitic ration. Blood and bone analyses failed to identify the condition with rickets. It was thought that the condition was induced by the mineral matter present in the meat scrap used, and to obtain evidence on this observation day-old White Leghorn chicks were divided into four lots of 50 birds each and were fed the same basal ration, containing 4.7 per cent of ash. In some of the lots the basal ration was supplemented by additions of meat meal ash, accompanied by a decrease in the cornstarch of the basal ration. The respective lots received rations containing 4.7, 5.5, 6.3, and 7.1 per cent of ash.

The check ration gave as good growth as the rations containing a higher ash content and at the same time produced fewer birds with deformities. By the end of 6 weeks 6 birds in lot 2, 13 in lot 3, and 12 in lot 4 had developed deformities. There was no significant difference in the ash content of the bone or the calcium and phosphorus in the ash of the average normal and average abnormal birds. While the malformation was definitely nonrachitic and was associated with the high ash content of the ration, it was believed that possibly different results would be obtained if a different source of ash were used.

The effect of irradiating eggs with ultra-violet light upon the development of chicken embryos, W. Landauer (*Connecticut Storrs Sta. Bul. 179 (1932), pp. 193–218, fig. 1*).—Experiments were undertaken to obtain information on the effect upon development of exposing eggs to ultra-violet light. Criteria for detecting differences between treated and control eggs were embryonic mortality and hatchability. The eggs of Frizzle and creeper fowl were used. The eggs were exposed for intervals of either 25 or 30 minutes on the day before being put into the incubator to the rays of either a Cooper Hewitt lamp or a General Electric sun lamp at a distance of 46 cm. One batch of eggs was not exposed thereafter, while other eggs were exposed for 20 minutes on different days for a total of 4, 13, 14, or 15 exposures.

The untreated eggs from Frizzle matings gave the following hatches in percentage of fertile eggs: Low-grade Frizzles inter se 86.7, heterozygous Frizzle females by homozygous males 75.7, and homozygous Frizzles inter se 56.8. Irradiated eggs from the last two matings had a hatchability practically identical with the above.

With inter se matings of creeper fowl irradiation with either type of lamp improved hatchability from 8.5 to 13 per cent as compared with the controls. Embryonic mortality was lower during the second and third week in the irradiated eggs. The hatchability of heterozygous creeper and normal embryos was improved to about the same extent. Irradiation had no effect on the survival and development of homozygous creeper embryos. The chicks hatched from irradiated eggs had a lower mortality than those from the control eggs.

The influence of sex on the rate of growth of chicks, A. D. Holmes, M. G. Pigott, and P. A. Campbell (*Poultry Sci., 11 (1932), No. 5, pp. 301–306, fig. 1*).—In this study the author divided day-old Rhode Island Red chicks into 25 lots of 33 birds each. Each chick was leg-banded, and the lots were confined in

battery brooders for a period of 12 weeks. Each lot was fed a mash unsupplemented with grit, oyster shell, scratch grain, or other material. The mashes were made on a commercial scale, and the ranges in composition of the mashes were: Protein 0.4 per cent, fat 1 per cent, carbohydrates 1.9 per cent, ash 1.8 per cent, and energy value 55 calories per pound.

The average per chick weight of both sexes varied over rather wide limits. At 4 weeks of age the pullets weighed 93 per cent as much as the cockerels, and at weekly intervals thereafter to 12 weeks they weighed 88, 87, 85, 86, 83, 83, 83, and 82 per cent, respectively, as much as the cockerels. Both the growth curves of the two sexes and the "ratio of female to male weight" curve showed the progressively decreasing rate of growth of pullets as compared with cockerels. The authors concluded that when a correction is to be applied to data to eliminate the effect of different ratios of sexes in experiments the factor for conversion should be determined for the conditions of the particular test.

Factors influencing egg production.—III, The association of the date of hatch with date of first egg, sexual maturity and egg production in S. C. White Leghorns, C. W. KNOX (*Iowa Sta. Res. Bul. 152 (1932), pp. 245–260, figs. 6*).—Continuing this study (E. S. R., 64, p. 373), data were obtained from 684 Single Comb White Leghorns over a period of 4 years. The study was concerned with the association of date of hatch with the average date of first egg, the average number of days to maturity, and the average winter, spring, and annual egg production.

A positive rectilinear association was found between the date of hatch and the date of first egg. There was a very slight association between the date of hatch and the age at first egg. There was a decided curvilinear association between the date of hatch and the number of eggs produced to March 1. A positive rectilinear correlation existed between the date of hatch and spring egg production. The date of hatch had a curvilinear association with total egg production.

The value of progeny in relation to age of dam, A. W. GREENWOOD (*Harper Adams Util. Poultry Jour., 17 (1931–32), No. 10, pp. 478–480, fig. 1*).—Records on hatchability percentages were collected by the Institute of Animal Genetics, University of Edinburgh, from birds up to 7 years of age. The hatching records of the pullet year were considered as 100 per cent. In 2 years' results the yearling hens gave a slightly higher percentage hatch than the pullets, but 1 year's lot of birds were poor hatchers in their pullet year and declined steadily thereafter. After the second year in all lots there was a definite drop in the percentage of chicks hatched until the seventh year. Incubation records showed that up to 3 years of age the percentage of infertile eggs was comparatively small as compared with that of the 4- and 7-year-old birds. There was also a marked increase in number of dead in shell after the first 2 years.

Orientation of the hen's egg in the uterus and during laying, M. W. OLSEN and T. C. BYERLY (*Poultry Sci., 11 (1932), No. 5, pp. 266–271*).—The U. S. D. A. Bureau of Animal Industry collected data on flocks and individuals of the White Leghorn, Rhode Island Red, Barred Plymouth Rock, and Jersey Black Giant breeds and on crosses of Rhode Island Reds and Barred Rocks in an effort to establish the position of the egg in the uterus during the act of laying and at the exact instant of expression.

Approximately 90 per cent of the eggs examined were formed with the small end toward the caudal extremity. The Rhode Island Reds and the crossbreeds laid about 80 per cent of their eggs with the small end first, while the other breeds laid about 70 per cent of their eggs in this manner. Eggs which projected deeply into the posterior blind sac of the uterus sometimes turned

during the act of laying. Significant differences existed in the incidence of eggs laid large end first among individuals within a breed, as well as among birds of different breeds.

Producing and marketing good eggs, F. E. Elliott and L. E. Card (*Illinois Sta. Circ. 400 (1933), pp. 28, figs. 20*).—In this publication the authors discuss the production and marketing practices that should give the largest return to the producer. The production practices recommended are gathering eggs frequently, cooling eggs before casing, producing infertile eggs, preventing dirty eggs, feeding properly, and culling hens that lay poorly shaped, thin-shelled, and small eggs. The marketing practices discussed include the grading of eggs, proper packing, frequent selling, and the choosing of the most profitable outlet available. The text is well illustrated to bring out the points under discussion.

Two new species of bacteria causing mustiness in eggs, M. Levine and D. Q. Anderson (*Jour. Bact., 23 (1932), No. 4, pp. 337–347*).—A total of 11 musty eggs encountered in a commercial egg-breaking plant were examined for bacterial content, and attempts were made to isolate the organisms causing this odor. The causative organism was isolated from 4 of the eggs.

The morphological, cultural, and physiological characters of 25 must-producing cultures were studied. From these studies two species and one variety were recognized, for which the following names were suggested: *Pseudomonas graveolens, P. mucidolens,* and *P. mucidolens tarda.* These organisms produced a strong musty odor in agar, potato, gelatin, and broth media and when inoculated into eggs.

DAIRY FARMING—DAIRYING

[Experiments in Arizona with dairy cows and in dairying] W. S. Cunningham (*Arizona Sta. Rpt. 1932, pp. 86, 87–89*).—The results of studies with dairy cows are reported on the effect of stages of maturity of Hairy Peruvian and common alfalfa hay on milk production, feeding sprouted oats to barren heifers, and pasture for young calves.

The dairying studies include the preservation of skim milk curd for poultry feeding and a study of the properties of sweet buttermilk powder.

[Experiments in Michigan with dairy cattle and dairy products] (*Michigan Sta. Bien. Rpt. 1931–32, pp. 17, 18, 23–27*).—The experiments with dairy cattle include data on the effect of supplementing a basic ration of low-phosphorus alfalfa, corn silage, and corn with bone meal on growth, reproduction, and milk production; the relation of magnesium to calcium, phosphorus, and vitamin D in the ration of dairy cattle; feeding concentrates alone to ruminants; a study of the effect of feeding gossypol with a ration free from cottonseed meal; sun-cured hay and sunshine for preventing rickets in calves; viosterol as a source of vitamin D for calves; the effect of magnesium on the calcium assimilation of calves; and high v. low protein grain mixtures for cows on pasture.

Studies with milk and dairy products report data on the keeping quality of milk, effectiveness of dairy cleaners, coolers and the small-top pail as factors affecting clean milk production, effect of aging periods for ice cream mixes, the manufacture of a granular type of buttermilk, gelatin substitutes as stabilizers for ice cream, milk serum separation from bottled cream, and viscolization of milk.

[Experiments with dairy cattle and in dairying in South Dakota], T. M. Olson (*South Dakota Sta. Rpt. 1932, pp. 12–16*).—Results obtained in studies

with dairy cows are reported on a comparison of sweetclover, alfalfa, and Sudan grass pastures under South Dakota conditions, skim milk with foam v. skim milk without foam for dairy calves, value of sweetclover hay v. sweetclover pasture for dairy cows, oatmeal mill feed v. wild hay for dairy cows, the effect of sunlight upon vitamin D of cows' milk, influence of sunlight on the growth and health of dairy heifers, and crossbreeding investigations.

In dairying studies information is presented on amino acid titration as a measure of quality in dairy products, cost of delivering milk in small cities with horse-drawn and gas-propelled vehicles, the use of ice wells in milk production, and ammeter and pressure gauge comparisons in the operation of the viscolizer.

[Experiments in West Virginia with dairy cattle and dairy products] (*West Virginia Sta. Bul. 254 (1932), pp. 32–34*).—Studies with dairy cattle include data on effect of low-mineral rations on dairy animals, comparison of wet and dry beet pulp, and varieties of pasture for milk production.

In dairying results are reported on studies of flavor in dairy products, type of can as it affects cream in shipment, improving cottage cheese manufacture, and effect of pasteurization on bacteria in grade-A milk.

[Dairy cattle experiments in Montana] (*Montana Sta. Rpt. 1931, pp. 50, 51, 81–84, fig. 1*).—Data obtained in studies with dairy cattle include results on rye and on pea silage for dairy cows, improving the production of dairy cattle through the use of proved sires, alfalfa hay as the sole ration for dairy cows, and improving pastures by the use of better grasses and fertilizers.

[Investigations with dairy cattle in South Carolina] (*South Carolina Sta. Rpt. 1932, pp. 56, 57, 60–65*).—Experiments with dairy cows show progress data on the value of a corn and soybean mixture as the sole roughage for milk production and cottonseed meal in the ration of calves under 6 months of age, by J. P. LaMaster and E. C. Elting; a study of the calcium and phosphorus assimilation by dairy cows, by LaMaster, Elting, and J. H. Mitchell; effects of inheritance on milk and milk fat production, by LaMaster; and advanced registry records, by J. G. Moxon.

[Investigations with dairy cattle by the Washington Station] (*Washington Col. Sta. Bul. 275 (1932), pp. 27, 28, 29–31*).—Data are reported from studies with dairy cows on the relationship of physical characteristics of the cow's mammary system to production, by C. C. Prouty and E. V. Ellington; the determination of apparent digestibility by modified procedure, by J. C. Knott, R. E. Hodgson, and Ellington; the efficiency of rotational grazing in western Washington, and investigations of the carrying capacity of pure stands of pasture grasses—reed canary grass, by Hodgson, M. S. Grunder, and Knott; the feeding value and vitamin D content of artificially dried pasture grass, and the use of proved sires, by Hodgson and Knott.

[Studies with dairy cattle in Wyoming] (*Wyoming Sta. Rpt. 1932, pp. 9–14, 30*).—In experiments with dairy cows data are reported on palatability of alfalfa hay, milk production without grain, feeding dairy calves on limited milk allowances, measurements of sunflower silage, and records of production and costs of a dairy herd being graded up and improved by selection at the Afton Substation.

A formula for evaluating feeds on the basis of digestible nutrients, W. E. Petersen (*Jour. Dairy Sci., 15 (1932), No. 4, pp. 293–297, fig. 1*).—In this article from the Minnesota Experiment Station a graph is presented and its use described for determining the value of any feed on the basis of the values of corn and cottonseed meal.

Winter feeding of dairy heifers, C. B. Bender and J. W. Bartlett (*New Jersey Stas. Circ. 263 (1932), pp. 2*).—In an effort to show the most economical means of raising dairy heifers, a group of 18 grade Holstein heifer calves was fed a maximum of 6 lbs. of whole milk daily for the first 30 days. From 30 days to 6 months of age they received a ration made up of yellow corn meal, ground oats, wheat bran, linseed meal, soluble blood flour, and minerals. This ration was fed dry at a maximum rate of 6 lbs. per day, and in addition the animals were allowed all the alfalfa hay they would eat. After 6 months the heifers were fed all the roughage, consisting of silage, alfalfa, and oat hay, that they would eat until the first of May, when they were turned on pasture where they remained until the first of November. During their second winter they were again fed roughage and turned on pasture in the spring.

The heifers freshened at an average age of 2 years 4.5 months, weighing on the average 1,052 lbs. before freshening, and they were exactly normal in height. As 2-year-olds the heifers produced an average of 8,657.4 lbs. of milk and 290.7 lbs. of fat in 307 days, while the 3-year-olds averaged 9,228.4 lbs. of milk and 325.7 lbs. of fat in the same number of days. These results show that roughage and pasture fed from the time heifers are 6 months of age will produce normal milking cows with normal breeding history and with no apparent impairment in their powers to produce milk.

The use of skimmilk powder in grain rations for dairy calves, M. H. Berry (*Jour. Dairy Sci., 15 (1932), No. 4, pp. 287–292*).—The Maryland Experiment Station undertook a study to determine the value of adding skim milk powder to dried grain mixtures for feeding calves. Calves weaned at 8 weeks of age were divided into 3 lots of 10 head each. Lot 1 received the basal ration only, lot 2 the same ration to which 22+ per cent of the skim milk powder was added, and lot 3 the basal ration plus 36+ per cent of skim milk powder. The grain mixture was supplemented with clover hay ad libitum, salt, and water. Records were kept of growth and development for a period of 91 days.

The results showed that the increased weight or growth obtained by the addition of large amounts of skim milk powder were not sufficient to justify the increased cost of the ration.

The feeding value of artificially dried young grass, J. A. Newlander (*Vermont Sta. Bul. 350 (1933), pp. 15, figs. 2*).—Continuing this study (E. S. R., 68, p. 663), two groups of five cows each were fed by the reversal method through three periods of three weeks each, preceded by preliminary periods of one week each. Group 1 during the first period received a ration of mixed clover and timothy hay, corn silage, and a grain ration. During the second period artificially dried young grass was substituted for the grain, while in the third period the cows were returned to the original ration. The method of feeding group 2 was the opposite of the above.

These trials showed that grass cut at intervals of from 7 to 10 days resembled closely in composition and digestibility the 20 per cent dairy ration used. The fiber content of the dried grass was somewhat higher and the nitrogen-free extract content correspondingly lower. When 10 lbs. of the artificially dried grass was fed with liberal allowances of hay and silage and a small amount of grain, entirely satisfactory results were secured. Feeding this grass with two-thirds the regular allowance of silage and hay and no grain produced excellent results. While average milk production could be obtained by feeding this grass instead of all purchased concentrates, it was deemed advisable to supply about one-third the usual amount of grain when maximum production was desired or when high-producing cows were being fed.

Wet beet pulp compared with corn silage in the dairy ration, G. Q. Bateman and G. B. Caine (*Utah Sta. Bul. 239 (1932), pp. 40, figs. 5*).—To compare the value of corn silage and wet beet pulp two groups of cows, varying in numbers from 7 to 11 animals per group, were fed through four winter and four summer periods. During the winter periods the groups received alfalfa hay and grain and either corn silage or wet beet pulp. In summer the cows were on pasture without any additional feeding. Records were kept on body weight, feed consumption, feed refused, milk and fat production, and on breeding efficiency.

The average daily feed consumption during the four winter periods, which represented 5,384 cow days for the silage group, was 20.9 lbs. of alfalfa hay, 32.1 lbs. of silage, and 4.5 lbs. of grain. In the pulp group there were 5,224 cow days during the winter periods, and the cows consumed an average of 20.3 lbs. of hay, 68.1 lbs. of beet pulp, and 5.4 lbs. of grain daily. The silage ration was calculated to contain 0.4 lb. more dry matter than the pulp ration, while the latter contained 0.8 lb. more total digestible nutrients. On the average it required 2.1 lbs. of pulp to replace 1 lb. of silage.

During the winter periods the silage group produced an average of 23.5 lbs. of milk containing 0.77 lb. of butterfat daily, while the pulp group averaged 27.9 lbs. of milk containing 0.91 lb. of butterfat. The difference in production was not entirely due to the ration, for the cows in the silage group carried their calves for 0.15 day longer for each day they were in the experiment and also made a daily gain in weight of 0.16 lb. more than did those in the pulp group. At the prices charged it cost 3 cts. less per 100 lbs. of milk and 1 ct. less per pound of butterfat with the silage ration than with the pulp ration.

During the summer periods there was no significant difference in the production of the two groups, in the number of days the cows carried calves, or in the amounts of feed consumed.

No difference was observed in the health of the calves dropped in the two lots. It was observed, however, that cows in the pulp group developed tenderness of the hind quarters and walked as if in discomfort. These cows also licked the board fences and at times chewed sticks.

A study of methods used in conducting a silage feeding experiment, A. D. Pratt (*Jour. Dairy Sci., 15 (1932), No. 4, pp. 303–311, figs. 3*).—This paper from the Connecticut Storrs Experiment Station deals with the methods used and analyses of the data secured in the silage feeding experiment previously noted (E. S. R., 64, p. 675).

Data are presented to show the undesirability of short experimental periods and the dangers of the reversal type of experimental procedure. An analysis of 100 successive daily weights of a lot of 8 animals showed that weighing for 3 successive days of each 5-day period was practically as satisfactory as daily weighings. A statistical analysis of morning and afternoon weights showed that the animals averaged 16 lbs. heavier at 8 a. m. than at 1 p. m., but there was no significant difference in the probable error or the percentage coefficients of variability at these hours. The ratios of pounds of 4 per cent milk per pound of dry matter in the ration are presented for individuals and for groups with advance in lactation. These figures show a marked decline in efficiency of milk production with advance in lactation.

The relation of the soluble portion of alfalfa to the rapid absorption of feed flavor in milk, C. L. Roadhouse and J. L. Henderson (*Jour. Dairy Sci., 15 (1932), No. 4, pp. 299–302*).—A study was undertaken at the California Experiment Station to determine the rate at which the juice of the alfalfa plant made its appearance as a feed flavor in the milk. Green alfalfa cut just before

the bloom stage was placed immediately in a room at 15° F. and frozen. The object of freezing was to rupture the cell walls of the plant and aid in extracting the juice. After thawing at room temperature the plant was ground, the liquid pressed out, and filtered. From 5 to 6 qt. of liquid were obtained from 25 lbs. of hay, and this quantity was considered as a standard drench. This drench was fed to cows producing milk of good flavor after they had been deprived of all feed for 5 hours. A sample of milk was taken before drenching, and afterward at 5-minute intervals for 30 minutes other samples were drawn. In some cases the samples were also taken at 45 minutes, 1 hour, and 2 hours after drenching. Each sample was scored for flavor within 2 hours.

It required 20 minutes after the ingestion of the juice before feed flavor appeared in the milk. The most pronounced flavor was obtained in samples drawn 45 and 60 minutes after drenching.

Calcium and phosphorus metabolism in dairy cows.—V, The relative assimilation of calcium from grades 1 and 3 timothy hay, W. A. Turner, E. A. Kane, and W. S. Hale (*Jour. Dairy Sci., 15 (1932), No. 4, pp. 267–276*).—Continuing this series of studies (E. S. R., 67, p. 732) two tests with two heavy-milking cows each were conducted, with results which showed that grade 1 timothy hay exerted a more favorable influence on calcium assimilation than did grade 3 hay. Sodium citrate was also introduced in the tests with the idea that an acid radicle which predominates in alfalfa and which is capable of holding calcium in solution might be an aid to calcium assimilation, but there were no results to indicate that the ingestion of sodium citrate had any marked effect upon either the calcium or the phosphorus metabolism.

Method for obtaining representative samples of blood for inorganic phosphorus in dairy heifers, H. O. Henderson and A. H. Van Landingham (*Jour. Dairy Sci., 15 (1932), No. 4, pp. 313–319, figs. 2*).—In studies at the West Virginia Experiment Station the inorganic phosphorus content of the blood of dairy heifers was found to vary considerably from day to day. The average daily variation of 8 heifers over a 12-day period was 0.46 mg per 100 ml of blood, but variations of 1.72 mg over a 24-hour period and as high as 2.34 mg for the 12-day period were obtained.

The most satisfactory method of obtaining a representative sample was alternate-day sampling over a 12-day period. The average monthly range in variation as obtained from 4 animals over a period of 16 months by this method was 0.35 mg per 100 ml of blood. Storing blood at 2° C. for 2 weeks had no significant effect on its inorganic phosphorus content.

The effect of cod liver oil in the ration upon the quantity and quality of cow's milk, W. E. Petersen (*Jour. Dairy Sci., 15 (1932), No. 4, pp. 283–286, fig. 1*).—In a study to determine whether cod-liver oil had a depressing effect on the fat percentage of milk, the Minnesota Experiment Station divided a group of 12 cows of different breeds and in different stages of lactation into two groups. One lot received the regular dairy herd ration, while the other lot had 5 oz. of high-grade biologically-tested cod-liver oil added to the same ration for each cow. The test was divided into three periods of 15, 23, and 20 days' duration. During the first period both lots received the basal ration only, while in the second and third periods the cod-liver oil was fed to the alternate groups.

In every case where oil was fed, there was a marked decrease in fat percentage but no apparent effect upon the amount of milk produced. This depressing effect on fat percentage seemed to be cumulative for at least a time.

Increasing the vitamin-D content of milk.—II, The effect of feeding cows a cod-liver oil concentrate (Vitex), W. E. Krauss, R. M. Bethke, and

W. Wilder (*Ohio Sta. Bimo. Bul., 18 (1933), No. 1, pp. 15–19*).—Continuing this study (E. S. R., 67, p. 448), a group of six Holstein cows were fed the same basal ration for an initial period of 17.5 days. The milk and fat production of each cow was then calculated, and the group was divided into two approximately equal lots on this basis. During the next four days the milk from each lot was collected separately, the cream separated, and the aliquot composite samples of cream for the period were churned. The resulting butter was rendered into pure fat. A similar procedure was followed during the last four days of four succeeding periods, which were of 24, 32, 24, and 29 days in length, respectively. During periods 1, 3, and 5 both lots received the basal ration only. In period 2 lot 1 was fed in addition to the basal ration 6,000 rat units of Vitex, a commercial cod-liver oil concentrate, while lot 2 received 15,000 rat units of Vitex. During period 4 Vitex was fed to include 40,000 and 60,000 rat units in the rations of lots 1 and 2, respectively. The samples of pure fat obtained at the end of each period were analyzed for vitamin D by the standard line-test procedure.

The milk produced on the basal ration contained 2.76 rat units per quart, which was increased to 30.35 rat units per quart when 60,000 rat units of vitamin D as Vitex was fed. There were no indications that feeding Vitex at any level had any influence on the amount of milk or fat production. The 30.35 rat units per quart resulting from the feeding of Vitex at the high level was far below the 160 rat units per quart recommended for milk for use as an antirachitic agent for infants. The cost of Vitex also eliminates this product for use in increasing the vitamin D content of milk to the desired strength.

The incorporation of air during the homogenization of cream and of ice cream mixes, O. E. Williams and A. Leighton (*Jour. Dairy Sci., 15 (1932), No. 5, pp. 367–370*).—A series of tests was undertaken by the U. S. D. A. Bureau of Dairy Industry to determine the amount of air incorporated in creams and ice cream mixes during the homogenization process. Three creams containing 20, 25, and 30 per cent of fat, respectively, were pasteurized at 145° F. for 30 minutes and were divided into five lots, four of which were homogenized at varying temperatures and pressures and the other used as a control. High and low fat content ice cream mixes were also homogenized at varying temperatures and pressures.

Under normal conditions the maximum increase in volume of cream during homogenization was 4.3 per cent. When one intake valve of the homogenizer was closed a maximum increase of 11.2 per cent in volume was obtained. These values were not obtained unless the temperature of homogenization was very low. At the usual homogenizing temperatures no significant increases in volume were obtained with either cream or ice cream mixes.

VETERINARY MEDICINE

Textbook of histology and comparative microscopic anatomy of domestic mammals, A. Trautmann and J. Fiebiger (*Lehrbuch der Histologie und Vergleichenden Mikroskopischen Anatomie der Haussäugetiere. Berlin: Paul Parey, 1931, 6. ed., rev., pp. XI+394, figs. 447*).—This is the sixth revised edition of a work by W. Ellenberger and Trautmann, consisting of a general part with 5 chapters (pp. 3–81) and a special part with 12 chapters (pp. 82–350). Additional data are presented in an appendix (pp. 351–378).

[Report of work in Arizona in animal pathology] (*Arizona Sta. Rpt. 1932, pp. 78, 79, 86, 87, 117, 124, 125, 130, fig. 1*).—The work of the year reported upon relates to that with range livestock losses from poisonous plants, by E. B.

Stanley and E. L. Scott; infectious abortion in dairy cattle, by W. S. Cunningham; mycosis in chickens, by J. G. Brown; and ulcerated gizzards, by H. Embleton.

[Report of work in animal pathology and bacteriology in Michigan] (*Michigan Sta. Bien. Rpt. 1931–32, pp. 12–17*).—Reporting upon work with infectious abortion (E. S. R., 65, p. 771), brief accounts are given of its control and eradication, nonspecific abortions, agglutination tests, sterility, diseases of fetal membranes, retained fetal membranes, and involution of the uterus, as well as a study of the value of orthophenylphenol.

[Report of work in Montana in animal pathology] (*Montana Sta. Rpt. 1931, pp. 53–56, figs. 2*).—The work of the year on the diseases of sheep and lambs includes data on arthritis in lambs, foot rot in sheep, stiff lambs, and internal parasites in sheep. A brief reference is made to a modification of the rapid test for pullorum disease of the fowl.

[Work in animal pathology in South Dakota] (*South Dakota Sta. Rpt. 1932, pp. 9, 11, 12, 23–25, 29*).—In reporting upon the work of the year (E. S. R., 67, p. 69), reference is made to the value of oil of chenopodium in the treatment of pigs affected with worms, by J. W. Wilson; a study of the properties of the oil of chenopodium obtained by cross-fertilization of *Chenopodium ambrosioides* with a wild variety obtained from Kansas as well as the anthelmintic value of the oil obtained from this cross in the treatment of ascarids, by F. J. LeBlanc; alkali disease, by K. W. Franke; the effect of "alkalied" grain on growing chicks and poultry, by W. C. Tulley; and hemorrhagic septicemia, by C. C. Lipp.

[Work in animal pathology in West Virginia] (*West Virginia Sta. Bul. 254 (1932), pp. 28, 31*).—Brief reference is made to work on control of stomach worms and lungworms in sheep and on effective abortion control by part-time isolation.

[Report of work in animal pathology in Wyoming] (*Wyoming Sta. Rpt. 1932, pp. 17, 18, 19, 20, 21, 27*).—The work of the year referred to (E. S. R., 67, p. 70) includes that on the toxicity of several species of death camas (*Zygadenus* spp.), the lichen *Paramelia molliuscula*, and arrow grass (*Triglochin maritima*), the latter by O. A. Beath; and studies of contagious abortion, by A. M. Lee.

Veterinary science, F. C. Minett (In *Agricultural Research in 1929. London: Roy. Agr. Soc. England, 1930, pp. 153–182*).—This report on the advances in work with diseases of livestock deals with bovine contagious abortion, including the distribution in nature of the causative organism and control of the disease; tuberculosis, including the progress of eradication work in the United States and in Canada, tuberculosis in swine, and tuberculosis in poultry; fowl pox, including control of the disease by vaccination; canine distemper; and the warble fly; together with a list of 26 references to the literature.

Veterinary science, F. C. Minett (In *Agricultural Research in 1930. London: Roy. Agr. Soc. England, 1931, pp. 179–201*).—This report for 1930 deals with milk fever in cows; louping ill in sheep; and diseases of poultry, including bacillary white diarrhea, fowl typhoid, and fowl paralysis; and recent discoveries in the life histories of some lungworms of the pig and the sheep, by E. L. Taylor. A list of 34 references to the literature is included.

Diseases of animals: Prevention and treatment, F. C. Minett (In *Agricultural Research in 1931. London: Roy. Agr. Soc. England, 1932, pp. 24–49*).—This is a practical summary of information on foot-and-mouth disease, the survival of the virus and sources of infection (pp. 24–33); immunization of pigs against hog cholera (pp. 33–41); and intestinal disorders in calves, par-

ticularly white scours and vibrionic enteritis (pp. 41–48). A list of 17 references to the literature is included.

Animal diseases in South Africa, I, II, M. W. Henning ([*Johannesburg*]: *Central News Agency, 1932, vols. 1, pp. XI+405, figs. 43; 2, pp. X+407–878, figs. 84*).—The first part of volume 1 of this work deals with bacterial diseases (pp. 1–258) and part 2 with protozoal diseases (pp. 259–400); part 3 in volume 2 deals with virus diseases (pp. 407–629), part 4 with diseases caused by plant poisons (pp. 631–868), and part 5 with deficiency diseases (pp. 869–873).

Report by the senior veterinary officer, 1931, C. R. Turbet (*Fiji Dept. Agr. Ann. Bul., 1931, pp. 23–34*).—This report includes an account of the occurrence of and control work with the infectious diseases of livestock, particularly tuberculosis, also eradication of the tick *Haemaphysalis bispinosa*, discovered in the vicinity of Suva in 1930.

[Studies in comparative pathology, etc., in Japan] (*Jour. Japan. Soc. Vet. Sci., 11 (1932), Nos. 2, pp. 83–151, pls. 8; 3, pp. 183–268, pls. 4, figs. 8*).—The contributions presented in No. 2 (E. S. R., 68, p. 244) are as follows: Studies on Contagious Pleuropneumonia in Cattle—IX, On the Pathologic Anatomy of the Recovered Lesions of Lung Plague, by S. Yamagiwa and M. Niwa (pp. 83–104, Eng. abs. pp. 103, 104); *Gymnopleurus* sp. as the Intermediate Host of Spiruridae Found in the Vicinity of Mukden, South Manchuria—II, Studies on the Life History of *Arduenna strongylina*, by S. Ono (pp. 105–117, Eng. abs. pp. 116, 117) (E. S. R., 61, p. 676); On the Value of the Fresh Blood Rapid Agglutination Test for Pullorum Disease, by T. Konno and Y. Goto (pp. 118–130, Japan, abs. pp. 128–130); and Experimental Studies Regarding Living Swine Erysipelas Vaccine—I, The Pathogenicity and Antigenic Property of Swine Erysipelas Bacilli Treated with Acridine Derivative, by S. Kondō, S. Yamada, and K. Sugimura (pp. 131–151, Eng. abs. pp. 148–151).

The contributions presented in No. 3 include the following: Studies on Contagious Pleuropneumonia in Cattle—X, On the Practical Value of Sachs-Kolmer's Treatment of Serum for Elimination of Nonspecific Reaction in Complement-Fixation Tests for Diagnosis of Lung Plague, by S. Ito, Y. Sato, and T. Tani (pp. 183–201, Eng. abs. pp. 200, 201); Resistance of Vaccinated Calves against the Reinjection of Very Large Doses of Rinderpest-Virulent Blood, by C. Kakizaki and O. Isshiki (pp. 202–207, Eng. abs. pp. 206, 207); Morphological Studies on Larvae of *Hypoderma lineatum* at the Esophageal and Hypodermic States, with Special Reference to the Organ Containing Hypodermatotoxin, by S. Ono (pp. 208–223, Eng. abs. pp. 220–223); Hematological Studies on Korean Calves and Ponies Infected with a Formosan Strain of *Trypanosoma evansi*, by S. Akazawa (pp. 224–245, Eng. abs. pp. 243–245); Studies on the Specific Substance of *B. mallei*, by K. Sakamoto (pp. 246–256, Japan. abs. p. 256); and A Study of Reproduction in the Mare (Report I), by S. Satoh and S. Hoshi (pp. 257–268, Japan. abs. pp. 267, 268).

The war on livestock parasites, M. C. Hall (*Cornell Vet., 22 (1932), No. 4, pp. 297–319, pl. 1*).—This is a practical discussion of the subject.

Differentiation of the third larval stadium of the Ancylostomidae of man, dog, and cat, M. Eisma (*De Differentiatie van het Derde Stadium van de Larven der Ancylostomidae van Mensch, Hond, en Kat. Proefschr., Rijksuniv. Leiden; Haarlem: M. H. Groenendaal, 1932, pp. VIII+152, pls. 8, figs.* [70], *Eng. abs. pp. 146–150*).—This work deals with the anatomy of the third-stage larvae of *Necator americanus* (Stiles, 1902), *Ancylostoma duodenale* (Dubini, 1843) Crep., 1845, *A. caninum* (Erc., 1859), *A. ceylanicum* (Looss, 1911), and *Uncinaria stenocephala* (Rail., 1884), presented in connection with a list of 61 references to the literature.

Anaplasmosis diagnosed in Colorado, G. W. Stiles, jr. (*North Amer. Vet., 14 (1933), No. 2, pp. 47–49, figs. 2*).—Three cases of anaplasmosis which had their origin in the northwestern part of Colorado have been diagnosed. According to the information obtained, it appears probable that anaplasmosis has existed enzootically in restricted areas of that State for a number of years, perhaps not causing serious loss.

Blackleg prophylaxis with formolized vaccine of Leclainche-Vallée [trans. title], J. Schmiedhoffer (*Deut. Tierärztl. Wchnschr., 40 (1932), No. 35, pp. 545–547; abs. in Vet. Rec., 12 (1932), No. 47, pp. 1392, 1393*).—The author reports upon the use of the formolized vaccine produced by Leclainche and Vallée in 1925 by cultivation for several weeks in bouillon and devitalized with formalin. The work was conducted in districts in which blackleg occurs frequently, 667 young cattle and other animals having been inoculated by practitioners without loss of the treated animals. The immunity lasts for 6 months or longer and this method is preferred to the Nitta germ-free filtrate method introduced in 1912 (E. S. R., 39, p. 681). The simultaneous vaccination for malignant edema by addition of *Vibrion septique* is advised against.

Alexin fixation and agglutination test in Brucella infections, P. Morales Otero and G. Monge (*Puerto Rico Jour. Pub. Health and Trop. Med., 8 (1932), No. 2, pp. 193–204, figs. 3; Span. abs., pp. 201–204*).—The authors conclude that for general use the alexin fixation test has no marked advantage over the more widely used agglutination test, but that it is reliable and would be of great value as a confirmatory measure in cases in which the laboratory report conflicts with the clinical evidence.

Pasteurization of milk artificially infected with two strains of Brucella suis, S. E. Park, R. Graham, M. J. Prucha, and J. M. Brannon (*Jour. Bact., 24 (1932), No. 6, pp. 461–471*).—In experimental work "two strains of *B. suis*, in hermetically sealed glass tubes of whole milk (500,000,000 organisms per cubic centimeter), were nonviable after 20 minutes at 140° F., after 15 minutes at 142°, and after 7 minutes at 144°. The same strains proved more resistant to heat in cotton-stoppered tubes of milk. *B. suis* survived for 30 minutes at 144° in milk containing 10 000,000 to 500,000,000 organisms per cubic centimeter, but the same period of time at the same temperature destroyed *B. suis* in milk containing 5,000 to 1,000,000 organisms per cubic centimeter. Therefore, it appears that the thermal death time is influenced by the degree of contamination. The data suggest that efficient pasteurization will prevent milk-borne porcine brucelliasis. However, final conclusions are withheld pending results of studies on commercial pasteurizers."

Mastitis with metastatic abscesses, R. L. Johnson (*Vet. Med., 27 (1932). No. 8, pp. 358, 359*).—This is a report of a case of infection somewhat typical of a mastitis caused by a toxin-forming, nonhemolytic streptococcus.

Mastitis—II, The use of certain dyes in the treatment of mastitis, G. J. Hucker and D. A. Lee (*New York State Sta. Tech. Bul. 205 (1932), pp. 35*).—In continuation of earlier work (E. S. R., 68, p. 530), the authors report upon the use of crystal violet, brilliant green, and two compounds known commercially as acriflavine and azamine for the treatment of mastitis, both of the acute or clinical type and the latent or subclinical type. These therapeutic agents were administered orally, by intravenous injection, and by udder inflation. When administered orally or as an udder irrigant, the first three named did not appear to be suitable for such use. Acriflavine was less toxic than either crystal violet or brilliant green when introduced into the udder through the teat canal. Azamine had little effect upon the udder flora when fed orally or injected intravenously. Udder irrigations with azamine showed results

that were of sufficient promise to warrant further study of its usefulness in the treatment of mastitis. Field tests indicated that a certain percentage of cases studied were definitely benefited by treatment with azamine.

Rocky Mountain spotted fever (eastern type) virus recovered from the dog tick Dermacentor variabilis found in nature, L. F. Badger (*Pub. Health Rpts. [U. S.], 47 (1932), No. 53, pp. 2365–2369*).—The author records the recovery of the virus of Rocky Mountain spotted fever (eastern type) from an American dog tick collected on a farm in Virginia on which a human case of spotted fever had occurred.

The Salmonella group of bacteria, R. Lovell (*Bul. Hyg., 7 (1932), No. 7, pp. 405–415*).—This is a summary of information presented in connection with a list of 55 references to the literature.

Streptococcus infection in man caused through the medium of milk from infected udders, S. V. Golledge (*Vet. Rec., 12 (1932), No. 52, pp. 1499–1501*).—A report is made of an outbreak of acute streptococcus infection among the personnel of a small farm. The outbreak is considered of interest because the streptococci from four persons affected proved to be identical in their cultural and serological reactions, all belonging to the scarlatinal type I. It was found that two cows had probably been infected, through the agency of a milker, with hemolytic streptococci of human origin, and that the subsequent human cases were reinfected from the milk of these two animals.

The rabbit as a means of distinguishing the human from the bovine type of tubercle bacillus: The lesions caused in the rabbit by tubercle bacilli of the human type, L. Cobbett (*Jour. Path. and Bact., 35 (1932), No. 5, pp. 681–699, pls. 5*).—This report of work conducted deals particularly with lesions caused in the rabbit by the human type of tubercle bacilli, the rabbit being one of those animals which react differently to infection with the two types of mammalian tubercle bacilli. Calves or goats may give clearer results, but they are too expensive to be used except in special cases.

Tuberculosis in the Canada raccoon (Procyon lotor), M. H. Brown (*Roy. Soc. Canada, Trans., 3. ser., 25 (1931), Sect. V, pp. 159–162*).—The author reports upon the finding of tuberculosis in a raccoon received from Kirkfield, Ont. It was due to a rather long, beaded, acid-fast bacillus, having the characteristics of the bovine type. The animal is thought to have become infected through ingestion of infected material. The length of time that the animal had been in captivity could not be definitely determined, but it was supposed to have been only a few months.

Endemic typhus fever virus recovered from wild rat trapped at typhus focus in the United States, R. E. Dyer, W. G. Workman, and A. Rumreich (*Pub. Health Rpts. [U. S.], 47 (1932), No. 53, pp. 2370–2372*).—In further studies of the transmission of endemic typhus fever (E. S. R., 66, pp. 760, 761; 68, pp. 224, 528), the authors report upon the recovery of the endemic typhus fever virus from the brains of wild rats trapped in April, 1932, on premises in Savannah, Ga.

The cultivation of vaccinia virus: A new series of subcultures in cell-free medium, G. H. Eagles and A. H. H. Kordi (*Roy. Soc. [London], Proc., Ser. B, 111 (1932), No. B 772, pp. 329–337, fig. 1*).—The authors report that vaccinia virus has been cultivated through 10 generations in subculture in a medium in which whole cells could not be demonstrated.

Incidence and nature of tumors in captive wild mammals and birds, H. L. Ratcliffe (*Amer. Jour. Cancer, 17 (1933), No. 1, pp. 116–135*).—The author finds that "the incidence of neoplasms for the orders and families of birds and mammals dying in the Philadelphia Zoological Gardens has shown

very little variation over a period of 11 years. The percentage of animals in most orders and families that are affected by tumor growth is proportional to the average exhibition period of the group. That is, as age increases, incidence of tumors increases. Certain families of both birds and mammals have, however, a much lower incidence than should be expected from the average age for the group. Other avian and mammalian groups have much higher percentages of tumor bearers than the average age seems to warrant. Mammals, generally, are more subject to new growths of the digestive organs and birds to new growths of genito-urinary organs than to neoplasms affecting other parts of the bodies. The class Aves is, as a whole, less subject to tumor growth than the Mammalia."

Some poisonous plants of New Jersey, J. G. FISKE (*New Jersey Stas. Circ. 261 (1932), pp. 30, figs. 14*).—Brief, practical, illustrated accounts are given of 14 of the more important poisonous plants occurring in New Jersey.

Disinfection, E. C. MCCULLOCH (*Vet. Med., 27 (1932), No. 12, pp. 505–510*).—This is a report of work, a preliminary account of which from the Wisconsin Experiment Station has been noted (E. S. R., 67, p. 740).

The passage of fluids through the ruminant stomach, I. C. Ross (*Agr. and Livestock in India, 2 (1932), No. 4, pp. 425–443*).—This account is based upon a study of the passage of fluids through the stomach of some 140 sheep.

"It was not found that the administration of certain mineral salts per se markedly influenced the passage of fluids to the abomasum instead of to the rumen and reticulum. Fluids pass much more regularly to the omasum and abomasum in sheep which have been allowed no water (or food) for 40 hours than in those allowed no water for lesser periods. Where water and food are withheld for 40 hours, fluids pass to the abomasum in at least 75 per cent of cases, irrespective of the nature of the solution given. When water is not withheld prior to dosing, fluids pass to the abomasum in a minority of cases only, passing to the rumen and reticulum in the majority. Anthelmintic efficiency of drugs would probably be increased substantially by withholding food and water for 40 hours prior to the dosing, owing to the greater regularity with which drugs would enter the abomasum in concentrated solution. Smooth solid particles up to ⅜ in. in diameter will enter the omasum or abomasum when given in fluids which enter these divisions of the stomach directly."

Blood volume determinations in cattle, W. T. MILLER (*Cornell Vet., 22 (1932), No. 4, pp. 320–332*).—A report is made of 105 blood volume determinations made on cattle over a period of 18 months, in which the dye method of determination was employed. The minimum and maximum quantities found were 21 and 33.1 c c per pound of body weight. Seventy-five per cent of the values ranged between 25 and 30 c c. The average of 81 determinations was 27.07 c c per pound. Fluctuations in the weight of the animal were followed closely by changes in the blood volume. During pregnancy there was a marked increase in blood volume proportional to the weight increase until parturition occurred. Shortly afterwards, there was a decrease in both volume and in body weight. The blood volume was affected by Johne's disease only in proportion to the decrease in weight brought about by the disease. The author has not been able to determine whether the volume is absolute or simply relative.

Ameboid forms of leucocytes from the blood of cattle [trans. title], L. V. BUTOZAN and I. CELINŠĆAK (*Vet. Arhiv, 1 (1931), No. 1–4, pp. 135–157, pls. 6, figs. 35; Eng. abs., pp. 156, 157*).—This is a report of studies made with a view to determining the number of nuclear segments in nuclear neutrophile, eosinophile, and basophile leucocytes of the blood of cattle.

Observations on the significance of leucocytes in milk, S. D. Johnson and F. G. Trudel (*Cornell Vet., 22 (1932), No. 4, pp. 354–366*).—The authors' studies, the details of which are presented in tabular form, led to the conclusion that in general in mastitis there is an increase in cells in the milk that corresponds to the degree of change found on physical examination of the udder, the changes found in the milk, and the bacteriological findings. In mastitis there appears to be an increase in leucocytes that precedes the appearance of streptococci or staphylococci in the milk.

Bovine tuberculosis: Its history, control, and eradication, E. T. Faulder (*N. Y. State Dept. Agr. and Markets, Agr. Bul. 263 (1932), pp. 165, figs. 81*).—This practical summary of information deals with the subject, following the introduction, under the headings of bovine tuberculosis—its history and spread, use of tuberculin in diagnosis, official methods of tuberculin testing, other methods of diagnosis, post-mortem examination, disinfection, control and eradication of bovine tuberculosis, State indemnity, evidences of effectiveness of present plan of eradication, uniform methods and rules for accredited herds, keeping tuberculosis-free counties clean, and regulations in force in various States regarding the interstate shipment of cattle.

Bovine subcutaneous tuberculosis in a cow with no other demonstrable foci, M. H. Brown (*Roy. Soc. Canada, Trans., 3. ser., 25 (1931), Sect. V, pp. 163–167*).—The author reports upon studies of an organism having the characteristics of the bovine type of the tubercle bacillus which was isolated from a subcutaneous lesion in the region of the knee joint of a cow. No other demonstrable foci were found. Virulent tubercle bacilli were excreted in the urine, and the animal was sensitized to tuberculin.

Studies of the toxicity of ammonium thiocyanate for cattle, W. L. Nilson, W. L. Boyd, and C. P. Fitch (*Cornell Vet., 22 (1932), No. 4, pp. 347–353*).—In this contribution from the Minnesota Experiment Station the authors report upon studies made of the toxicity of ammonium thiocyanate, which during recent years has been recommended as a weed exterminator. Experiments demonstrated this chemical to be quite toxic, especially for cattle, and to be more toxic than sodium chlorate, which has also been recommended as a weed exterminator. It is pointed out that the substance is repellent to cattle and is not consumed by them under ordinary conditions.

Copper poisoning in sheep [trans. title], J. A. Beljers (*Tijdschr. Diergeneesk., 59 (1932), No. 22, pp. 1317–1324; Ger., Eng., Fr. abs., pp. 1323, 1324*).—A description is given of several cases of chronic copper poisoning in sheep which had grazed in orchards sprayed with a solution of copper sulfate. The clinical symptoms often appeared only after a long period, shortly before death. They include a marked anemia, icterus, hematuria, and hemoglobinuria, bloody feces, an accelerated pulse rate (due to anemia and degeneration of the heart), and normal temperature.

Sheep parasites and diseases, J. Carew (*Queensland Agr. Jour., 38 (1932), No. 5, pp. 438–453, figs. 7*).—A digest of information on the parasites and diseases of sheep in Queensland.

Caseous lymphadenitis—the disinfection of shearing machine handpieces, H. R. Carne (*Jour. Council Sci. and Indus. Res. [Aust.], 5 (1932), No. 4, pp. 212–214*).—Experiments conducted with a view to finding a suitable means of disinfecting shearing machine hand pieces responsible for the transmission of the causative organism of caseous lymphadenitis are briefly reported. Of the disinfectants used cresylic acid proved to be the most satisfactory, but was capable of destroying all organisms only when used in a concentration of 50 per cent in mineral naphtha. The addition of lubricating oil to the vehicle greatly reduced the efficiency of the disinfectant.

Infectious mastitis in sheep [trans. title], H. Mieszner and G. Schoop (*Deut. Tierärztl. Wchnschr., 40 (1932), No. 5, pp. 69–75, figs. 6*).—During the lambing season of 1931, 27 cases in 8 herds were investigated by the authors. *Bacterium mastitidis* (Dammann and Freese) was isolated 23 times (7 times mixed with other pathogenic organisms), micrococci 7 times, and *B. pyogenes* 3 times. *B. mastitidis* was found to resemble *B. purifaciens* and Dungal's bacillus of ovine pneumonia. The affected sheep generally die within 3 days. In many herds as high as 15 per cent or more of the ewes contract the disease. Encouraging results were obtained from preventive vaccination of 800 ewes, 100 per cent protection resulting from three applications of a bacterin.

A list is given of 36 references to the literature.

Pregnancy disease of sheep, L. M. Roderick and G. S. Harshfield (*North Dakota Sta. Bul. 261 (1932), pp. 31, figs. 4*).—The authors report upon a study of the toxemia of pregnancy, one of the most common causes of loss among ewes in the late winter and early spring before the appearance of grass. The losses in individual flocks sometimes amount to 25 per cent, and the case mortality is about 90 per cent. The disease develops during the last month of pregnancy under two sets of conditions: (1) In ewes which are well fed and are in fair to excellent condition, it being associated usually with a lack of exercise, and (2) in sheep which are in poor flesh as a result of an inadequate ration.

It is pointed out that the disease is not infectious in character. Pathological changes are confined to the liver and kidneys. There is an enormous increase in the fat in the liver, so that a content as high as 68 per cent (dry basis) has been found as compared with 10 to 11 per cent for the normal animal. This is considered to represent injury from toxic substances with the consequent deposition of fat rather than a manifestation of plethora. The nephrosis present is a result and not a cause of the disease.

"The acidosis, which arises in a deficient endogenous supply of carbohydrate which follows liver injury and the impairment of the glycogenic function, is responsible for the altered physiology and the symptoms of the disease. The ketone acids, which form in that abnormal metabolism, promptly deplete the alkaline reserve through decomposition of the blood bicarbonate, so that the salts of those organic acids are excreted and the acid-base balance of the body protected.

"There seems as yet to be little encouragement in attempting to treat those ewes in which the disease is already well established. More satisfaction will be secured by prompt attention to measures of prevention. Liberal exercise will check the losses in flocks which are in good condition where deaths have occurred through some irregularity in the care. An adequate ration of good quality combined with liberal exercise will be the best safeguard in preventing losses in breeding ewes."

Swingback (ataxia) in lambs, W. L. Stewart (*Vet. Jour., 88 (1932), No. 4, pp. 133–137, figs. 6*).—An account of studies of swingback, the shepherd's name for a chronic disease affecting the nervous system of young lambs, which is characterized by muscular incoordination of the hind limbs (ataxia).

Enzootic ataxia of lambs in Western Australia, H. W. Bennetts (*Aust. Vet. Jour., 8 (1932), No. 4, pp. 137–142*).—A preliminary account is given of a disease which affects lambs in certain areas in Western Australia, here designated as enzootic ataxia. "Clinically the disease resembles conditions described as occurring in Europe and South America. It nevertheless presents certain special features which are not mentioned by other workers. Pathologically, there is a nervous degeneration similar to that recently described for lambs affected in England with 'swingback.' In chronic cases there is a

sclerosis of the spinal cord. The etiology is obscure and is being investigated along lines which are indicated."

Ascaris larvae as a cause of liver and lung lesions in swine, B. SCHWARTZ and J. E. ALICATA (*Jour. Parasitol., 19 (1932), No. 1, pp. 17–24, figs. 3*).—In studies conducted in continuation of those previously noted (E. S. R., 63, p. 573), lesions observed from time to time in the liver and lungs of swine were found to be due to the presence of small pearly cysts, from 1 to 2 mm. in diameter, when measured while in situ.

"Each cyst contains a granular material and also shows at times, though not invariably, a nematode larva in a state of evident degeneration. The larva is brittle and has a uniformly granular appearance. It is indistinguishable morphologically from the corresponding stages of *A. suum* as described by Ransom and Foster [E. S. R., 43, p. 275]. The lung lesions are limited to the presence of the pearly cysts, while the liver lesions are more striking and appear as a marked mottling of the surface of this organ. The mottling is due in part to an increase of interlobular connective tissue, and in part to the presence of cysts underneath the capsule.

"Liver lesions indistinguishable from those which contain discrete cysts and larvae in the cysts are of common occurrence in swine in this country. The larvae evidently disintegrate in the cysts, apparently earlier in those in the liver than in those in the lungs, which accounts, in all probability, for the presence in swine livers of discrete cysts not containing worms. The geographical distribution of liver lesions in swine, similar to those described in this paper as being due to Ascaris larvae, makes it probable that these worms are responsible for this condition."

Brucella Bang infection in the horse [trans. title], J. A. BIEJERS (*Tijdschr. Diergeneesk., 59 (1932), No. 20, pp. 1221–1225; Ger., Eng., Fr. abs., pp. 1224, 1225*).—The author draws attention to the general clinical symptoms of horses infected with *B. abortus* not previously described in literature. The affected horses observed suffered from lassitude and inability to work, but were possessed of good appetites and remained in good flesh. A continuous fever of from 38.5 to 40° C., which could not be influenced by administrations of salol, antipyrine, antifebrin, etc., is said to have been the outstanding symptom. There was a moderate hyperleucocytosis but no anemia. The pulse was frequently lower than the temperature would indicate. Agglutination of *B. abortus* was strongly positive up to 1 to 12,000 and even higher. A positive ophthalmic reaction to a Brucella preparation was obtained. Marked local swelling and abscess formation followed the injection of a killed suspension of *B. abortus*. In some cases later on local inflammatory processes occur (fistulous withers, abscess of the sternum, fistulous neck), and occasionally tendovaginitis and coxitis were seen in the course of the disease.

The prognosis is said to be favorable, the course of the disease extending over two months or longer, with fever continuously present. Rest is the only treatment necessary.

The dog's medical dictionary, A. J. SEWELL, rev. by F. W. COUSENS (*London: George Routledge & Sons, 1932, rev., pp. XII+324, pls. 34, figs. 24*).—This is a revised and largely rewritten edition of the work previously noted (E. S. R., 23, p. 487).

Advances in the field of avian anatomy and physiology [trans. title], E. STRESEMANN (*7. Internatl. Ornithol. Cong., Amsterdam, Proc., 1930, pp. 53–72*).—This review of the literature is accompanied by a list of 60 references.

Poultry diseases common in Hawaii, C. M. BICE (*Hawaii Sta. Circ. 5 (1932), pp. 39, figs. 14*).—Following a general discussion of sanitation, accounts are given of the diseases and parasites affecting poultry in Hawaii.

Bronchitis of baby chicks, C. S. Gibbs (*Poultry Sci., 12 (1933), No. 1, pp. 46–48*).—This contribution from the Massachusetts Experiment Station reports upon the study of a disease of baby chicks, simulating infectious laryngotracheitis, which occurred on a poultry farm in two successive hatching seasons. A hemolytic streptococcus to which the name *Streptococcus bronchitis* has been given appears to be the cause of the disease. This new form was found to differ from *S. epidemicus* and *S. pyogenes* morphologically, culturally, and pathogenically.

A histochemical study by microincineration of the inclusion body of fowl pox, W. B. C. Danks (*Amer. Jour. Path., 8 (1932), No. 6, pp. 711–716, pl. 1*).—The author finds that "following incineration at high temperatures the fowl pox inclusion body leaves a grayish white residue consisting of minute particles of mineral ash. The location of this residue corresponds topographically to that part of the inclusion body which stains pink with erythrosin-azure. The minute particles of mineral ash correspond in relative size and location to the 'Borrel bodies' and are the inorganic residue of these structures. There is evidence that the Borrel bodies having, as they do, a relatively large amount of inorganic material in them, might well serve as a locus for adsorption of virus."

Vaccination against fowl pox, H. R. Seddon and J. K. Hutchison (*Agr. Gaz. N. S. Wales, 42 (1931), No. 12, pp. 969–972*).—This is a report upon vaccination work with fowl pox in the field which extended through two seasons. Of 5,127 fowls vaccinated in 1929–30, a season with little pox, only 0.31 per cent contracted the disease as compared with 8.49 per cent of the 5,440 controls. The second season 12,516 pullets and 489 cockerels on 22 properties were vaccinated and 8.6 per cent of the pullets and 4.5 per cent of the cockerels developed fowl pox, as compared with 67.1 per cent of 5,313 nonvaccinated pullets and 26.7 per cent of the nonvaccinated cockerels running with vaccinated birds.

Vaccination against fowl pox, H. R. Seddon, J. K. Hutchison, and W. J. B. Murphy (*Aust. Vet. Jour., 8 (1932), No. 5, pp. 172–180*).—It was found in vaccination work extending over three seasons, in which birds from 6 to 20 weeks of age were used, that, other conditions being favorable, the optimum age for vaccination was between 12 and 16 weeks.

Virus vaccination for the control of fowl pox, C. L. Morgan and L. W. Smith (*South Carolina Sta. Rpt. 1932, p. 98*).—A brief reference is made to the effective control of fowl pox at the station by vaccination.

"Vaccinated chicks," a new sales idea! R. M. Sherwood (*Hatchery Tribune, 6 (1932), No. 12, pp. 10, 11, fig. 1*).—This is a contribution from the Texas Experiment Station reporting briefly upon a study of the effect of early vaccination of chicks for fowl pox. Of 175 chicks inoculated as they were taken from the incubator, 156 showed scabs of successful vaccination. On the fourteenth day the 19 remaining chicks were revaccinated, but none showed scabs from the second vaccination, suggesting a resistance to the infection without a visible local reaction. None of the chicks vaccinated between hatching time and 10 days of age showed any severe systemic reaction other than the formation of scabs. All were active, ate well, and made satisfactory gains throughout the period following the vaccination.

Turkey poults were vaccinated when 14 days old, no severe systemic reaction resulting.

The author recommends vaccinating chicks at 1 to 10 days of age and poults when 2 weeks old.

Research on epithelioma contagiosa of birds [trans. title], A. Castelli and R. Pili (*Bol. Ist. Sieroterap. Milan., 10 (1931), No. 6, pp. 293–307*).—Studies of the nature of the virus of contagious epithelioma, its transmissibility, te-

nacity, the nature of the disease, and immunity are reported upon. It is concluded that the virus of epithelioma and that of avian diphtheria are different but often occur together. The virus of epithelioma does not pass through the Berkefeld W candle. The epithelioma virus confers an immunity against the disease but not against avian diphtheria. The diphtheria infection confers no immunity to either the virus of diphtheria or of epithelioma.

Laryngotracheitis in chicks, L. D. Bushnell and C. A. Brandly (*Poultry Sci., 12 (1933), No. 1, pp. 55–60*).—In this contribution from the Kansas Experiment Station the authors describe a disease met with during the hatching season of 1930 among baby chicks, commonly designated "gasping disease," which caused widespread loss throughout the Middle West.

The work has shown that "the 'gasping' symptom is due to a filtrable virus infection with severe involvement of the larynx, trachea, bronchi, and lungs. In a large percentage of the field cases the symptoms are complicated by pullorum disease, and occasionally by infection by nonspecific organisms of known or unknown nature. The symptoms and lesions in the chicks are similar to those seen in so-called largyngotracheitis of adult birds, and are probably due to the same agent. Typical symptoms have been produced in chicks by intratracheal, subcutaneous, and intraperitoneal injection of filtrate from typical tracheitis in adult birds and again transmitted to adult birds by filtered material from these chicks."

The behavior of the avian malarias in the common fowl, an abnormal host, R. D. Manwell (*Amer. Jour. Trop. Med., 13 (1933), No. 1, pp. 97–112*).—The author finds that the common chicken is susceptible to infection with *Plasmodium circumflexum*, *P. praecox*, and *P. cathemerium* but not with *P. rouxi* and *P. elongatum*, although plasmodia of the two species last named may remain viable in the blood for some hours. Although chickens are susceptible to malarial infection with the species of plasmodia named above, they are much more resistant than birds such as the canary, and the parasites seem able to maintain themselves for only a few days. In no case was an infection proved to last more than 10 days.

A note on mycotic pneumonia of chickens, A. Savage and J. M. Isa (*Sci. Agr., 13 (1933), No. 5, p. 341, fig. 1*).—This is a report on pneumonia, due to *Aspergillus fumigatus*, which developed in some 400 day-old chicks when placed in a brooder in which dry corn silage was used as litter and resulted in a mortality of more than 90 per cent.

Pullorum disease of domestic fowl: A monograph, L. F. Rettger and W. N. Plastridge (*Connecticut Storrs Sta. Bul. 178 (1932), pp. 103–192, pls. 2, figs. 7*).—Following a brief introduction (pp. 109–111), part 1 is chiefly historical, including a systematic review of the investigations conducted at the station (pp. 111–159). Part 2 consists of a systematic review of contributions of various investigators to the present knowledge of pullorum disease and its etiological agent (pp. 160–185). The account is presented in connection with an eight-page list of references to the literature.

Bacillary white diarrhea: A contribution to its diagnosis by agglutination and pullorination [trans. title], E. Leynen and R. Willems (*Ann. Méd. Vét., 77 (1932), No. 2, pp. 49–79, pls. 2, figs. 2*).—The comparative value of methods of agglutination and pullorination in testing for pullorum disease are considered, 14 references being made to the literature.

The parasitic entity of Aegyptianella pullorum (Carpano 1928), M. S. Eldin (*Arch. Schiffs u. Tropen Hyg., 36 (1932), No. 7, pp. 400–407*).—The morphological comparison here reported upon, although limited by the supply only of Giemsa-stained Aegyptianella preparations, is considered to show clearly

that the nuclear inclusions produced by phenylhydrazine in the blood of fowls, reported by Knowles, Das Gupta, and Basu (noted on page 823), can not be considered identical with *A. pullorum* (or Balfour bodies), the only similarity being the nuclear staining of both. A list is given of 32 references to the literature.

Twelfth annual report on eradication of pullorum disease in Massachusetts, 1931–32, H. Van Roekel, K. L. Bullis, O. S. Flint, and M. K. Clarke (*Massachusetts Sta. Control Ser. Bul. 63 (1932), pp. 80, figs. 3*).—This annual report (E. S. R., 65, p. 776) is presented under 11 headings.

In antigen studies (pp. 2–10), concentrated *Salmonella pullorum* antigen remained as sensitive and specific after 583 days' storage at approximately 8° C. as freshly prepared antigen. "Dilute antigen of a pH 8.4 did not suffer an appreciable decrease in any of its essential qualities in a period of 15 weeks when held at a temperature approximately 8°. Addition of sufficient sodium hydroxide to adjust the pH to 8.3–8.5 did not cause a detectable autolysis or clearing in dilute antigen during 15 weeks of storage at approximately 8°. Slight variations in the morphology of stock cultures held at 8° or transferred to fresh medium weekly were observed. Antigens from cultures transferred weekly or stored at a temperature of approximately 8° for 49 weeks were as satisfactory for use in making agglutinable antigen as cultures held at 22° and transferred at monthly intervals."

In work with jellied blood samples (pp. 10–15), "a jellied condition was produced in chicken blood samples by immediate centrifugalization and by exposure to low temperatures. The atmospheric temperature at the time of collection appeared to be a major factor in the incidence of jellied blood samples of chickens. The application of heat materially reduced the number of jellied samples. The application of heat immediately after collection was found to be more satisfactory for reducing the number of jellied samples than the application of heat at the laboratory 16 to 24 hours later. The individual blood collector was a variable factor in the incidence of jellied samples. The incidence of jellied samples was greater among samples containing 0.5 c c of blood than among those containing 1 c c."

It was found in feeding birds on fresh eggs laid by reacting hens that noninfected females may contract pullorum disease in this way (pp. 15–19).

On exposure of pullorum disease-free birds to soil and litter contaminated with feces from positive reacting birds (pp. 19–22), the birds in both experiments remained negative to the tube agglutination test. The 62 birds employed in the experiments were autopsied and negative results obtained in the attempted isolation of *S. pullorum.*

In a study of the dissemination of *S. pullorum* infection among sexually immature females (pp. 22–26), the details of which are presented in tabular form, it was found that transmission of the disease did not occur among sexually immature reacting and nonreacting pullets while in contact for 111 days, as determined by the macroscopic tube agglutination test. The serum titers of the majority of positive reacting birds decreased during the course of the experiment, fluctuation of serum titers having been observed in some birds.

A study of the pathogenicity of *S. pullorum* in relation to Aves other than chickens (pp. 26–39) has led to the conclusion that "*S. pullorum* is pathogenic in varying degrees for the guinea fowl, pheasant, pigeon, and sparrow. Pullorum disease in the adult guinea fowl and adult pheasant resembles the disease in adult chickens. *S. pullorum* was recovered from eggs laid by artificially infected pheasants. The agglutination production was slightly stimulated in pigeons even after long exposures to the organism. Sparrows succumbed readily

to artificial exposure of the organism. It appears that a sound eradication program might find it expedient to recognize these Aves as hosts, in addition to chickens, in combating pullorum disease."

An investigation of the agglutinins in chicks (pp. 39–48) led to the following conclusions: "Although *S. pullorum* agglutinins sufficient in amount to establish a diagnosis were not present in the sera of 15 chicks from 5 to 19 days of age, *S. pullorum* was isolated from 10 of the chicks. *S. pullorum* agglutinins sufficient in amount to establish a diagnosis were not present in the sera of 93 artificially exposed chicks from 5 to 19 days of age. *S. pullorum* was isolated from 60 of the chicks. In the sera of some chicks, 7 and 14 days of age, hatched from eggs from reacting hens, *S. pullorum* agglutinins were present in sufficient quantity to establish a diagnosis, and *S. pullorum* was isolated from some chicks which did not show agglutinins. In three groups of chicks all reactors were detected, with one exception, by the end of the eleventh, ninth, and ninth weeks, respectively. Some reactors detected between the fourth and ninth weeks of age later became nonreactors, and *S. pullorum* was not isolated upon necropsy. *S. pullorum* was isolated from nonreacting chicks up to 8 weeks of age."

Regarding avenues of infection (pp. 48–55), it was found that "pullorum disease can be reproduced in chickens by dropping a suspension of the organisms on the conjunctiva, into an incision in the skin of the plantar surface of the foot, into the cloaca, and by oral administration. The introduction of organisms through the oral route did not appear as successful in reproducing the disease as the other avenues of exposure which were studied. It appears possible that pullorum disease dissemination may occur through all these avenues under natural conditions where a suitable environment exists."

In a comparison made of diagnostic tests for pullorum disease (pp. 55–68) "the whole blood and tube agglutination methods revealed a greater efficiency in favor of the latter method. *S. pullorum* was isolated from birds that had not reacted at any time to the whole blood test. In all but one of these cases, the birds possessed low titers. Failure to detect infected birds with the whole blood method occurred most frequently with birds possessing low titers. *S. pullorum* was isolated from three birds that were negative to both methods at the time of necropsy. While the whole blood method has a diagnostic value, it does not appear as sensitive in detecting infected birds as the tube method."

A comparison of intensive testing with annual testing in pullorum disease eradication (pp. 68–70) led to the conclusion that "intensive testing is more efficient than annual testing in the eradication of pullorum disease from a flock. Testing of all the birds on the premises is more efficient than partial flock testing. The most efficient testing procedure for the eradication of pullorum disease from a flock is (1) to test all birds in the flock on each test [and] (2) to retest at 4- to 6-week intervals until the flock has received at least one or more negative tests."

During the season of 1931–32, in which 421,895 fowls from 462 flocks were tested, the details being presented in tabular form, less than 1 per cent reacted positively (pp. 70–75).

The report includes a list of 97 references to the literature referred to in connection with the studies reported.

Pullorum control in New Brunswick, F. L. Wood (*Sci. Agr., 13 (1932), No. 3, pp. 165–177*).—This is an account of the progress of control work with pullorum disease in New Brunswick since 1924, when the agglutination test was first applied to the flock at the Dominion Experimental Station at Fredericton. A summary of the results obtained in testing from 1928 to 1931, inclu-

sive, including data as to the severity of infection during these years, is reported in detail in tabular form.

The work is considered to have been successful to a marked degree. It is pointed out that all testing has been done by commercial laboratories, and that the results have been decidedly consistent.

Studies in avian spirochaetosis, R. KNOWLES, B. M. DAS GUPTA, and B. C. BASU (*Indian Med. Res. Mem. 22 (1932), pp. [2]+113, pls. 9, fig. 1*).—Part 1 of this contribution consists of a review of the previous literature, 1891 to 1930 (pp. 1–48), and part 2 of a report of the spirochetosis transmission inquiry under the Indian Research Fund Association at the Calcutta School of Tropical Medicine, 1927 to 1931 (pp. 49–102). An 11-page list of references to the literature is included.

In infection work 80 per cent of 1,991 half-grown fowls infected died in the acute phase of the disease with their blood swarming with spirochetes. After the first appearance of spirochetes in the blood the mean interval to death was 2.72 days. Although search was made for any phase of granule or spore formation by *Spirochaeta anserina,* the authors were unable to find any evidence of such a phase in either the vertebrate or invertebrate host. Balfour's granules can be produced in the erythrocytes of clean, noninfected fowls by chronic poisoning with benzyl benzoate or phenyl hydrazine. The authors conclude that Balfour's granules are due to extrusion of chromatin from the nuclei of the erythrocytes poisoned by the toxins of the disease, and that they do not constitute any phase in the life history of *S. anserina.* Relapses are extremely rare with the Indian virus of avian spirochetosis, only 2 occurring in 2,177 birds infected during the course of 4 years. Recovery from the disease is accompanied by a solid immunity, the immune serum possessing strongly protective powers. On the other hand, the leucocytes of immune birds do not appear to possess any phagocyte powers.

Pigeons are susceptible to infection, but in these birds the virus gradually becomes attenuated and finally becomes nonvirulent. It is not likely that the disease could establish itself in these birds in nature. The Indian crow, sparrow, myna, and partridge are all susceptible to infection. Hereditary transmission was found to occur in female fowl ticks.

Further studies on the life cycle of the avian tubercle bacillus, R. R. MELLON, R. D. RICHARDSON, and L. W. FISHER (*Jour. Bact., 25 (1933), No. 1, pp. 45–47*).—The authors report that experimental work has shown the life cycle of the tubercle bacillus to consist of four stabilized stages which are vegetative and three transition stages between them which are reproductive or gonidial, seven in all. Of the reproductive stages two are probably asexual.

Selection for resistance to fowl typhoid in the chicken with reference to its inheritance, W. V. LAMBERT and C. W. KNOX (*Iowa Sta. Res. Bul. 153 (1932), pp. 261–295, figs. 5*).—In the course of studies of inheritance of natural resistance to fowl typhoid, in which a pathogen of constant virulence and a uniform method of infection were employed. it was found that the degree of infection influenced the mortality in unselected chicks. Both total mortality and rate of mortality were increased by the heavier doses.

"Four generations of selection for resistance to a standard dose of fowl typhoid bacteria resulted in a decided decrease in mortality in the selected population. The mortalities observed in the chicks of the selected generations, S1 to S4, were respectively 40, 29, 15, and 23 per cent. In the unselected (control) population the respective mortalities were 90, 93, 86, and 86 per cent. The increased mortality in the selected S4 population was due to unavoidable chilling of the last two groups of chicks tested in that generation.

"An analysis of the breeding records of the selected population shows degrees of inbreeding over 30 per cent for some of the birds of this stock, but so far it is difficult to evaluate the part that the inbreeding has played in bringing about the increased resistance of the selected stock. Reciprocal crosses of selected by unselected birds demonstrated that the male as well as the female transmits resistance to the offspring. These results show that a passive transfer of immunity was not a great, if existent, factor in the enhanced resistance of the selected progeny. F_1, F_2, and back-cross progenies from a parental cross of resistant with highly susceptible unselected birds indicated the presence of genetic factors for resistance.

"No evidence was found of a linkage between major factors for resistance or susceptibility and the gene for inhibition of plumage color (I), or its allelomorph (i). Nor was there evidence of major sex-linked factors for resistance.

"With the exception of one cross (selected males with unselected females) significant differences in mortality were not observed between males and females."

It is concluded that inherent resistance to fowl typhoid is controlled by multiple factors, some of which show dominance or partial dominance.

Fowl typhoid in baby chicks, A. KOMAROV (*Vet. Rec., 12 (1932), No. 50, pp. 1455–1457*).—The author reports upon outbreaks of fowl typhoid in baby chicks in Palestine, together with additional epidemiological evidence on the mode of transmission of the infection.

Records of distribution of internal parasites of poultry in the Province of Quebec, A. D. BAKER (*Sci. Agr., 13 (1932), No. 2, pp. 127–130, 131, figs. 3*).—Records are given of the geographical distribution of 10 forms parasitic on poultry in Quebec.

The gizzard worm in Quebec, R. L. CONKLIN (*Sci. Agr., 13 (1932), No. 2, pp. 126, 131, fig. 1*).—The author records the occurrence of *Cheilospirura hamulosa*, commonly known as the gizzard worm of chickens and turkeys, at several points in the Province of Quebec.

A comparative study of the fowl and pigeon coccidium [trans. title], H. S. HOFKAMP (*Tijdschr. Diergeneesk., 58 (1931), No. 16, pp. 867–878, pls. 3; Ger., Eng., Fr. abs., pp. 877, 878*).—Four of 11 chickens were successfully infected by ingestion of the pigeon coccidium (*Eimeria pfeifferi*). Healthy chickens were then given oocysts obtained from the feces of these 4 chickens, and a serious infection resulted. After one passage through chickens the pigeon coccidium appeared to have become as virulent for other chickens as the ordinary fowl coccidium (*E. tenella*). Of 4 young pigeons which ingested fowl coccidia, 4 contracted a slight infection. Morphologically the fowl and pigeon coccidia are identical, except that there is a slight difference in shape of the oocysts. After development in chickens the oocyst of the pigeon coccidium takes the form of fowl coccidiosis.

The author is of the opinion that the pigeon coccidium and the fowl coccidium do not belong to different species but that they are identical. A chemical disinfectant, caporit, in a 10 per cent solution proved to be effective. The oocysts were destroyed very quickly. Ten per cent of sodium carbonate and 10 per cent of antiformin were found to be useless. Therapeutically the author tried creolin, tricresol, spirocid, rivanolette, igitol, and ichthargan, but only with ichthargan (½ g per kilogram) were satisfactory results obtained.

A survey of the helminth parasites of the domestic fowl and domestic pigeon in Queensland, F. H. S. ROBERTS (*Queensland Agr. Jour., 38 (1932), No. 4, pp. 344–347*).—Fifteen species of helminth parasites were found during

the course of examinations made of 128 birds, principally from the Brisbane district.

Efficiency of treatments for internal parasites, W. L. Bleecker and R. M. Smith (*Poultry Sci., 12 (1933), No. 1, pp. 27–30*).—The work here reported has shown that there is a considerable difference in the efficiency of commercial worm remedies. It was found that a vermifuge consisting of Blackleaf 40 and Lloyd's alkaloid reagent plus 15 grains of kamala can be recommended as an efficient worm expeller above the others studied.

Partridge disease and its causes, edited by M. Portal and W. E. Collinge (*London: Country Life Ltd., 1932, pp. IX+96, pls. 7, figs. 23*).—Part 1 of this work (pp. 1–44) deals with the work of the partridge disease enquiry committee, including the increase of diseases in partridges (pp. 3–19); analysis of weather charts (pp. 20–24); stock and inbreeding (pp. 25–28); the Hungarian partridge (pp. 29–33), with notes by H. B. Moser (pp. 31–33); penned partridges on the French system (pp. 34, 35); and the hand-rearing of partridges (pp. 36–40) and partridges and the Euston system (pp. 41–44), both by M. Whelan. In part 2 partridge diseases and their symptoms are dealt with by Collinge (pp. 45–91).

The results obtained from the inquiry reported show that "the partridge disease is due to a small nematode worm, *Trichostrongylus tenuis* (Mehlis), which infests the ceca of the intestine and causes irritation and congestion of these organs, in consequence of which they cease to function, and the contents soon become a decomposing mess, producing soluble poisons that are absorbed into the system. The eggs on leaving the bird's body with the feces develop into larval worms, which make their way up the damp stems of various plants and secrete themselves on or between the leaves, which later are eaten by the partridge. The nematode is thus conveyed to the alimentary canal, where development is completed, and in the ceca the strongyli pair and produce eggs. The larval strongyli are capable of living a considerable time without moisture, but prolonged drought is fatal to both eggs and larvae. Wet seasons are favorable to the parasites and the dissemination of the disease.

"There is a marked increase in the disease toward the end of the year, and later a further outbreak amongst the newly hatched chicks, the maximum of disease being reached in September. During the epidemic such as the one inquired into (1929–1932) there is no period when birds are not dying. Numerous wild birds were examined, but only the pheasant was found to contain the same parasite. Earthworms were found to act as carriers of the eggs and larval worms.

"This investigation seems to indicate that interbreeding, the carrying of large winter stocks, and an insufficiency of food have much to do with the spread of the disease, as also meteorological conditions such as prevailed during 1929–1931."

The transmission of fowl-tumours to pheasants, C. H. Andrewes (*Jour. Path. and Bact., 35 (1932), No. 3, pp. 407–413*).—The author reports that both cells and filtrates of Rous sarcoma No. 1 have produced fatal progressive tumors in the large majority of inoculated pheasants. Metastases have occurred in nearly all tumor-bearing pheasants, particularly in the lungs.

Leucocytozoon smithi infection in turkeys and its transmission by Simulium occidentale Townsend, L. V. Skidmore (*Zentbl. Bakt. [etc.], 1. Abt., Orig., 125 (1932), No. 5–6, pp. 329–335, figs. 4*).—Contributing from the Nebraska Experiment Station, the author reports upon a study made in the course of a severe outbreak of disease with a high mortality which occurred in a farm flock of turkey poults near Wilber, Nebr., in 1930.

"*L. smithi* were found in great numbers in the blood of nearly all turkeys. No *L. smithi* were found in the blood of chickens, ducks, and geese raised on this farm. Bacteria as a cause of this disease were excluded. Attempts to transmit the protozoa with turkey lice, *Eomenacanthus stramineum* Nitz., and with flies, *Stomoxys calcitrans*, failed. The artificial injection of heavily parasitized blood with *L. smithi* into susceptible poults did not produce infection. *Simulium occidentale* Towns. was found to act as an intermediate host and produced *L. smithi* infection in susceptible poults. To the writer's knowledge this is the first time that an intermediate host has been proved to transmit *L. smithi*. It is also the first report of the presence of *S. occidentale* Towns. in Nebraska."

Diseases of the claws, E. Hess, rev. by E. Wyssmann (*Handbuch der Tierärztlichen Chirurgie und Geburtshilfe*, edited by T. Schmidt and E. Fröhner. *IV. Band, 3. Teil, Klauenkrankheiten. Berlin: Urban & Schwarzenberg, 1931, 3. ed., rev., pp. VIII+255, pl. 1, figs. 161; rev. in Cornell Vet., 22 (1932), No. 2, pp. 207, 208*).—A revised edition of a work on the normal and diseased claw, the second edition of which was issued in 1913. A four-page list of references to the literature is included.

Development of an acquired resistance in rabbits by repeated infection with an intestinal nematode, Trichostrongylus calcaratus Ransom 1911, M. P. Sarles (*Jour. Parasitol., 19 (1932), No. 1, pp. 61–82, figs. 8*).—In studies conducted in the department of animal and plant pathology of the Rockefeller Institute for Medical Research, Princeton, N. J., weekly increasing doses of the infective larvae of an intestinal nematode, *T. calcaratus*, were given to laboratory rabbits by mouth and by skin, and the resulting infections followed by frequent egg counts.

"All of the rabbits were susceptible to infection at first as shown by increases in the egg counts roughly proportional to the number of larvae given, but after 6 to 8 weekly doses of larvae they became refractory to superimposed infection and finally discharged the worms which they did harbor. This self-cure manifested itself by sharp drops in the egg counts associated with passage of soft pellets and liquid feces containing adult worms. The rabbits as tested by a later second series of infections were found to possess a high degree of acquired resistance. Those previously infected by mouth were resistant to later infection by mouth and by skin, and those infected initially by skin were also resistant to infection by either method. In contrast to the sudden loss of infection from rabbits given repeated doses of larvae, the infection produced in a rabbit given a single dose of larvae showed a constant rate of loss over a period of 49 weeks, as determined by egg counts."

AGRICULTURAL ENGINEERING

[Agricultural engineering investigations at the Arizona Station], G. E. P. Smith (*Arizona Sta. Rpt. 1932, pp. 64–71, fig. 1*).—The progress results of studies on ground water supplies and movement, pumping machinery, and citrus irrigation are briefly reported.

[Agricultural engineering investigations at the Michigan Station] (*Michigan Sta. Bien. Rpt. 1931–32, pp. 5–7*).—The progress results of investigations on the stelliting of plowshares, ultility of the pen dairy barn and separate milking room, and the use of whitewash and paints are briefly reported.

[Agricultural engineering investigations at the South Dakota Station], R. Patty (*South Dakota Sta. Rpt. 1932, pp. 4, 5*).—The progress results of investigations on corn harvesting machinery, rammed earth for farm building

walls, and the comparative length of service of galvanized steel posts and painted steel posts are briefly reported.

[Agricultural engineering and soil erosion investigations at the Washington Station], C. A. LARSON, W. A. ROCKIE, A. J. JOHNSON, and P. C. MCGREW (*Washington Col. Sta. Bul. 275 (1932), pp. 63, 64, 67–70, 72, 74*).—The progress results of investigations on irrigation, specific conductance of soil and irrigation water, flume repair materials, vegetative control of erosion, terracing, operation of machinery on terraced land, effect of tillage, and effect on erosion of hogging off waste peas, and effect of erosion on cost of farm operations are briefly reported.

Surface water supply of the United States, 1931, Parts 4, 7, 9 (*U. S. Geol. Survey, Water-Supply Papers 714 (1933), pp. V+160, fig. 1; 717 (1932), pp. V+108, fig. 1; 719 (1932), pp. V+121, fig. 1*).—Part 4 of this report, prepared in cooperation with the States of Illinois, Indiana, Michigan, Minnesota, New York, Ohio, Vermont, and Wisconsin, presents the measurements of flow made on streams in the St. Lawrence River Basin during the year ended September 30, 1931. Part 7, prepared in cooperation with the States of Arkansas, Kansas, Mississippi, Missouri, Tennessee, and Texas, and part 9, prepared in cooperation with the States of Arizona, Utah, and Wyoming, present corresponding measurements for the lower Mississippi and Colorado River basins, respectively.

Irrigation experience in 1928 and 1929 [trans. title], S. VERDESCA (*Bari Staz. Agr. Sper. Pub. 20 (1932), pp. [2]+1–36, pls. 6*).—The results of experiments at the station with surface irrigation, subirrigation, and overhead spray irrigation on different crops during 1928 and 1929 are summarized.

The superiority of overhead irrigation for cereals was established with particular reference to economy in the use of water, water penetration into the soil, and crop increase. On the other hand, subirrigation was superior for root growth, with particular reference to the creation of a reserve of moisture in the subsoil.

Flow of water through circular, parabolic, and triangular vertical notch-weirs, F. W. GREVE (*Purdue Univ., Engin. Expt. Sta. Res. Ser. 40 (1932), pp. 84, figs. 15*).—A large number of studies are recorded the purpose of which was to determine the relation between head and rate of discharge for a given weir notch and to develop a general equation for computing the rate of discharge through different notches of given shape.

In tests of circular weirs it was found that a change occurs in the logarithmic relation between head and discharge when the depth in the plane of the notch equals the radius and again when the depth is equal to the maximum hydraulic radius. It was found that the advantage of the circular notch, together with its diminutive form, the semicircular notch, lies in the ease and accuracy with which it can be formed. A restricted range in head constitutes its principal disadvantage. This type of weir is not to be recommended for a depth through the notch greater than the radius.

Tests of parabolic weirs showed that the discharge coefficient for beveled notches and negligible approach velocity decreases as the head and size of opening are increased. It is also apparent that the numerical change in the coefficient for any weir is approximately constant between heads of 0.1 and 1.2 ft. The parabolic notch possesses advantages over the rectangular notch for the measurement of relatively small flows. The disadvantage of the parabolic notch lies in the difficulty of cutting it true to form.

Experiments with triangular weirs indicated that the assumption so frequently made that the discharge coefficient is constant for a given notch is

erroneous. Apparently the coefficient is dependent upon head and independent of size. It is considered unwise to formulate a general expression for discharge from such weirs from data compiled from different sources unless such an expression incorporates certain factors which correlate the variations in the physical characteristics of the testing plants.

Four appendixes are included, one consisting of an abstract of literature on the subject of weirs and water measurement and the other three giving tables of data for the three types of weirs tested.

Solution of special problems in pipe flow by graphical analysis, G. K. PALSGROVE (*Rensselaer Polytech. Inst., Engin. and Sci. Ser. No. 37 (1932), pp. 29, figs. 10*).—An intricate mathematical and graphical analysis covering five special cases of flow in pipes is presented.

Rapid filter hydraulics disclosed by experiments (*Engin. News-Rec., 109 (1932), No. 22, pp. 647–650, figs. 5*).—Experimental data are reported from which the loss of head resulting from the passage of clean water through a bed of graded sand is evaluated in terms of the physical factors, including depth, rate, size, porosity, and temperature. A formula is derived for this purpose as follows:

$$l=\frac{9.84}{10^3}\left[\frac{dr}{s^{1.89}\ (t+20.6)}\right]$$

where l is the loss of head in feet, d the depth of sand bed in inches, r the rate of flow in m. g. d. per acre, s the sand size in millimeters, and t the water temperature in Fahrenheit degrees.

Purification of water especially for drinking purposes by filtration [trans. title], W. HOFFMANN (*Fortschr. Landw., 7 (1932), No. 20, pp. 511–515, figs. 6*).—In a contribution from the Moorland Experiment Station at Bremen, Germany, the results of studies on the purification of water obtained from heath sand soil are reported. It was found possible to improve this water by aeration and sand filtration, and a further improvement was secured by ultrafiltration.

Aggregate analysis as an aid in the study of soil structure relationships, L. D. BAVER and H. F. RHOADES (*Jour. Amer. Soc. Agron., 24 (1932), No. 11, pp. 920–930, figs. 6*).—Studies conducted at the Missouri Experiment Station are reported which involved experiments with the elutriator as a means of determining structure relationships with soils.

The principle of the elutriator is based upon the separation of particles by a moving stream of water, this being accomplished by regulating the velocity so that it will just balance the rate of fall of the particle or aggregate as calculated by Stokes's law. The elutriator used consisted of three elutriation tubes of different diameters, arranged with the tube of smallest diameter connected directly with the water supply, and in which the soil is placed for analysis. The third elutriation tube is the largest in diameter and possesses an outlet and a piezometer tube to indicate the velocity of the water.

The results suggest that the state of aggregation designates the extent to which a soil breaks up into aggregates, and that the stability of structure refers to the stability of the structural aggregates. An equation is suggested for characterizing the state of aggregation of a soil as follows:

$$\text{State of aggregation}=\Sigma[\%\ \text{aggregates}]_a^b$$

where a is the lower limit of size as determined from the distribution curves of the size of particles in the soil, with and without dispersion, and b is the upper limit of size as determined by the stability of the aggregate in an excess of

water. The stability of structure is measured by the change in the degree of aggregation as affected by the time of shaking of the soil in an excess of water.

A simple and rapid method for measuring the stickiness of soils, G. Bouyoucos (*Soil Sci., 34 (1932), No. 5, pp. 393–400, pl. 1*).—Studies conducted at the Michigan Experiment Station are reported in which a method of measuring the stickiness of soils is described. The method is based on the interpretation of stickiness as an important factor in those dynamic properties of soils relating to tilth and the operating of tillage machinery. The principle of the method consists in pressing a small metal disk against the surface of a thoroughly puddled and kneaded soil, and then pulling this metal disk vertically upward by means of a spring balance upon which the force of pull is directly recorded. The moisture content of the soil is gradually varied until the maximum pull is obtained.

The results obtained with the method showed that the maximum degree of stickiness measured in pounds per square inch varies from 0 in muck and sand to about 10 lbs. in some of the clays. It appears that there is a fairly close relationship between the maximum stickiness and the clay content in most soils, but that in some soils this relationship is very slight. There is also some, though not a close, relationship between the maximum stickiness and the upper plastic limit in most soils, but there are some very distinct exceptions.

Terracing to control erosion, J. S. Glass (*Kans. State Col. Ext. Bul. 70 (1932), pp. 41, figs. 59*).—A large amount of practical information is given in this well-illustrated publication on terracing and gully control. It appears that the broad base terrace having a slight grade is best adapted to Kansas conditions.

The effect of aggregate and other variables on the elastic properties of concrete, P. M. Noble (*Kans. Engin. Expt. Sta. Bul. 29 (1932), pp. 27, figs. 22*).—Studies on the elastic properties of sand-gravel concrete in particular and on the effects of various types of coarse aggregates on these properties are reported.

The results indicate that there is a very pronounced difference in the shape of the curves for different types of aggregate. The curves for the hard flinty aggregates are much steeper than for the softer aggregates. The very marked effect of variations in aggregate upon the value of the modulus of elasticity is particularly significant, the extent of this variation being such that it should by all means enter into the design of reinforced concrete structures.

For sand-gravel concrete there is a decided tendency of the value of modulus of elasticity to increase with an increase in the fineness modulus. There is no definite relation between the fineness modulus and Poisson's ratio within the limits of these tests. A maximum value of modulus of elasticity for sand-gravel concrete was obtained for mixes of 1:3.5 to 1:4, with lower values for the richer and leaner mixes. However, the richer mixes show a greater increase with age. Variation in the richness of mix has no pronounced effect on the value of Poisson's ratio. Maximum values of the modulus of elasticity occur for a water-cement ratio of 0.7.

There is no definite relation between the modulus of elasticity and the 28-day strength for concrete made of various types of aggregate. For a given aggregate an increase in the ultimate strength is accompanied by an increase in the modulus of elasticity.

The strength of concrete masonry walls after standard fire exposure, C. A. Menzel (*Jour. Amer. Concrete Inst., 4 (1932), No. 3, pp. 113–142, figs. 11*).—This paper presents data on the load-carrying capacity of concrete masonry

walls, made with units of widely varying chracteristics, both during and after exposure to standard fire test conditions. Comparative data on similar walls not exposed to fire are also included. The investigation comprised tests on more than 200 walls 5.5 ft. wide, 6 ft. high, and 4, 8, and 12 in. thick, and are of significance in connection with the development of fire resistance in farm structures.

It was found that the compressive strength of concrete masonry walls, tested both without exposure to fire and after exposure to fire was directly proportional to the original compressive strength. The strength of walls exposed to fire was influenced to a more marked degree by the type of aggregate than by the type of mortar, but to an even greater extent by the type of mortar joints and character of mortar bedding. When the cement content of the mortar was reduced below that of a 1:1:6 mixture a decrease resulted in wall strength which was approximately proportional to the decrease in the cement content of the mortar. The strength of walls plastered on either the exposed face or on both faces was appreciably higher after fire exposure than that of unplastered walls exposed for the same or shorter periods.

No outstanding advantage was discernible in wall strength after fire exposure for one design of unit over another in tests of walls of the same thickness laid up with units of different design, but comparable as to the proportion of core area, the proportion of net area bedded, and strength (gross area). An outstanding feature of the investigation was the substantial load-carrying ability and safety exhibited by the walls before, during, and after severe fire exposure.

Present methods of testing draft animals and their defects, E. Moskovits ([*Internatl. Rev. Agr.*], *Mo. Bul. Agr. Sci. and Pract.* [*Roma*], *23 (1932), No. 5, pp. 173–178*).—This is a critical discussion of present methods of testing the draft power of horses, and the defects thereof are pointed out. The opinion is expressed that tests of draft capacity must primarily furnish data for the selection of breeding stock. To obtain this result the findings of draft tests must be expressed in a manner allowing comparison with other tests made under other conditions. It is thought that available methods supply only relative facts, the classification being affected by means of points, thereby giving no information regarding the quantity of work done by animals being compared.

The principles of woodworking: A survey of present knowledge on this subject, W. W. Barkas, E. D. van Rest, and W. E. Wilson ([*Gt. Brit.*] *Dept. Sci. and Indus. Res., Forest Prod. Res. Bul. 13 (1931), pp. VI+35, figs. 29*).—A survey is presented of the present knowledge of the subject. It deals with the general principles of cutting, rotating cutters, and saws, and suggests a program of experimental work. It contains a bibliography and ap pendixes on cutting angles, grinding angles, and sharpness angles on the rotary planer; ripple marks; hook and clearance in the ripsaw tooth, grinding cutters for wood-molding machines; and change of effective cutting angle with inclination of knife to the direction of cut.

Flocculation, dispersion, and settling of pigments in relation to adsorption, L. W. Ryan, W. D. Harkins, and D. M. Gans (*Indus. and Engin. Chem., 24 (1932), No. 11, pp. 1288–1298, figs. 9*).—The results of studies conducted at the University of Chicago are reported on the adsorption by pigments of various compounds, including metallic soaps, whose molecules contain a polar group, from solutions in a nonpolar liquid. Observations are also presented concerning the effects of the adsorption on flocculation, dispersion, and settling, and on the behaviors of pigments in what may be termed solutions of infinite concentration—that is, in pure organic liquids.

The pigments used were titanium oxide, titanox-B, titanox-C, zinc oxide, and zinc sulfide. The pure organic liquids used were benzene, carbon tetrachloride, methanol, benzaldehyde, ethyl acetate, oleic acid, and, for a part of the work, a great many other liquids. The metallic soaps used were precipitated and fused lead linoleate, precipitated and fused cobalt linoleate, precipitated aluminum stearate, precipitated titanium stearate, and in some experiments precipitated and fused lead tungate.

It was found that when suspended in a liquid containing a polar-nonpolar compound, pigments adsorb on their surfaces a monomolecular film of the polar-nonpolar compound. This adsorption has a marked influence on the flocculation, dispersion, and settling of the pigments. Experiments on the settling of various pigments in dry pure organic liquids, and also in organic mixtures, show remarkable differences between the extent of the settling when (1) the pure liquid or solution consists entirely of nonpolar molecules, (2) either all, or a small fraction, of the molecules are of the polar-nonpolar type, and (3) water is also present.

In case 1 the suspension is highly flocculated and the volume of the suspension is large—for example, 16 c c per cubic centimeter of solid with a certain pigment. In case 2 the flocculation disappears if enough polar-nonpolar molecules are present to give a monomolecular adsorbed film on the grains of powder, and the volume falls to about 5 c c. In case 3 water added to (2) restores the flocculation and high volume of suspension characteristic of (1). The powders are dried in a high vacuum at temperatures of from 350 to 500° C., and the liquids are also dried with care. Experiments have been carried out with several white pigments in a great many organic liquids, and in solu tions in benzene of metallic soaps and various organic compounds.

Public Roads, [January–February, 1933] *U. S. Dept. Agr., Public Roads, 13 (1933), Nos. 11, pp. 169–184+[2], figs. 20; 12, pp. 185–200, figs. 9).*—No. 11 of this periodical contains the current status of Federal-aid road construction as of December 31, 1932, and the following articles: Surface Treatment of Topsoil Roads, by J. S. Williamson and P. F. Critz (pp. 169–176, 184); and Effect of Size of Specimen, Size of Aggregate, and Method of Loading upon the Uniformity of Flexural Strength Tests, by W. F. Kellermann (pp. 177–184). No. 12 contains A Survey of Highway Transportation in Michigan (pp. 185–196, 200) and Motor Tourist Traffic in Michigan (pp. 197–200).

The effect of jacket and valve temperatures on knock ratings of motor fuels, F. H. Garner and E. M. Dodds (*Engineering [London], 134 (1932), Nos. 3469, pp. 45–47, figs. 7; 3470, pp. 60–62, figs. 8*).—Studies are reported in which an engine with solid valves, one with liquid-cooled valves, and an air-cooled engine were used with a fuel of poor antiknock value (octane number of 50) as a reference fuel. Additions of definite proportions of benzol were made to this fuel, and the amount of lead tetraethyl required to be added to the reference fuel to give the same antiknock value was then determined on each of the three engines.

With the solid-valve engine the lead tetraethyl-benzol equivalents were relatively little influenced by even variations of jacket temperatures between 100 and 150° C., but with the engine with liquid-cooled valves the differences were much more marked. At 50° a mixture of 75 parts of benzol and 100 parts of gasoline required about one-third more lead in the standard gasoline to give a fuel of equal antiknock value as did a similarly proportioned benzol-gasoline blend in the first engine. With the air-cooled engine the amount of lead tetraethyl required to equal a benzol mixture in antiknock value was, in general, less than that of either of the other two engines.

For the three engines at 100° the relation between benzol and lead tetraethyl was approximately linear, the equivalents being expressed by the relationship that the addition of 10 per cent benzol is equal to 0.50 c c of lead tetraethyl per imperial gallon. With the more efficiently cooled engines it was found that more lead tetraethyl is required at the higher concentrations of benzol.

In every case, with higher cylinder-head temperatures lead became relatively more effective as an antiknock agent. This was shown to a remarkable extent with the air-cooled engine, where very high temperatures were obtained.

The results obtained in the engine with the solid valves showed that the effect of temperature on the knock rating of fuels containing either benzol or lead tetraethyl is much less marked than with the other two engines.

In the course of these experiments a series of five fuels was employed with octane numbers ranging from 55 to 75. These represented typical spirits sold on the British market, the 75-octane number fuel being a highly cracked spirit. A comparison was made between these various spirits and the blend of reference fuel with either lead tetraethyl or benzol.

With solid valves all the motor spirits required slightly lower percentages of both lead tetraethyl and benzol in the reference fuel at the higher temperatures than at the lower temperatures, i. e., the antiknock value expressed either as lead tetraethyl or benzol in the reference fuel is lower at the higher temperatures. The quantity of lead tetraethyl in the reference fuel required to equal the various motor spirits was much lower at the higher temperatures, with one exception. Much higher percentages of benzol in the reference fuel were, however, required at the higher temperatures than at the lower temperatures. The cracked fuel required proportionately less benzol at the higher temperatures than the other spirits.

These results are considered to emphasize the fact that in order to obtain consistent antiknock values of motor fuels, it is essential that the same standard test engine be used and the conditions of operation carefully standardized.

It was found further that in the solid-valve engine, with fuels of similar antiknock tendencies, the temperature of the exhaust valve varies to a considerable extent. Similarly, the temperature of the exhaust valve varies widely according to the conditions of operation and extent of valve guide wear. Repeat experiments on the same fuels, on different days under different conditions, showed wide variation in temperatures.

Tractor engine tests using gasanol, gastarla, pure kerosene, and mixtures of pure kerosene and crude oil as fuels, A. L. Teodoro and J. Banzon (*Philippine Agr., 21 (1932), No. 6, pp. 370–413, figs. 8*).—Studies at the University of the Philippines to determine the possibilities of various fuel mixtures from the standpoints of economy, crank case oil dilution, steadiness of engine operation, carbon deposition, and wear in bearings and other moving parts are reported.

The engine used was one of standard make rated at 40 h. p. The fuels used included gasanol, which consists of a mixture of rectified alcohol 50 per cent, gasoline from 40 to 45 per cent, and commercial ether from 5 to 10 per cent; gastarla, consisting of a mixture of rectified alcohol 60 per cent and gasoline 40 per cent; three kinds of pure kerosene; and two groups of kerosene-Diesel fuel mixtures. The compression ratio of the engine was approximately 4.42:1.

The results of tests using pure kerosene and mixtures of kerosene and crude oil justified the presence of a water injection attachment to the carburetor. The amount of injection water required was found to be an indication of the antiknock qualities of the fuels. However, when injection water was added in

excess quantities the resulting effects were unsteady operation, poor economy, and loss of flexibility.

The highest maximum power was developed in the hydrocarbon groups, and the tendencies to detonate, deposit carbon, and produce dilution were at a minimum. The use of mixtures of kerosene and crude oil not only resulted in increased fuel consumption but caused a greater tendency to carbon deposition, increased wear, decreased power, and crank case oil dilution. These tendencies increased as the percentage of Diesel fuel increased.

The most satisfactory operation was obtained by the use of alcohol-gasoline blends. The operation was characterized by steadiness, silence, and absence of fuel knocks, together with the greatest maximum power and high thermal efficiency. However, there were indications of corrosion of the exhaust-valve stems, which was unfavorable.

Preheating of alcohol fuels proved to be an advantage at low loads because of the resulting better flexibility and lower fuel consumption. However, at high loads extra heat caused not only a decrease in volumetric efficiency with a corresponding loss of power but also unsteadiness in engine operation.

With small variations, an increase in crank case oil dilution indicated a definite decrease in specific gravity and in viscosity of the lubricating oil. The aging of the engine expressed in number of hours of operation from the breaking-in period and the piston ring wear showed that it was possible to obtain wide variations in fuel consumption per brake horsepower-hour at equal loads from the same fuel. It was also deduced that the greater the percentage of crude oil in the kerosene-crude oil mixtures the greater was the ring wear calculated to length of engine operation, and the higher the dilution and carbon deposit.

With the compression ratio used the alcohol-gasoline combinations gave a slightly higher brake efficiency than the hydrocarbon fuels.

Use of wood gas as fuel for power motors [trans. title], G. KÜHNE and E. FISCHER (*Technik. Landw., 13 (1932), No. 4, pp. 75, 76, fig. 1*).—This is a brief preliminary contribution from the Technical Academy of München in which experiments were undertaken to reveal lines along which the efficiency of wood gas as an internal-combustion engine fuel may be increased.

It was found that the power output of wood gas in a tractor motor was about 38 per cent less than that of benzol. However, its antiknock properties permit raising the compression ratio, resulting in higher thermal efficiency, less combustion residue, and more complete combustion. It is thought that these factors may be utilized to offset the lower fuel quality of the wood gas to a considerable degree.

A study of isolated electric plant costs, A. G. TYLER (*Agr. Engin., 13 (1932), No. 11, pp. 291, 292*).—A brief summary and analysis made at the Minnesota Experiment Station is presented of data collected from 10 States on 75 different plants of 14 different makes. The average size of generator was 910 w and the average battery capacity 147 a hours. The average plant cost $485, and it is estimated that the average cost per kilowatt-hour was 18.3 cts., at an average monthly consumption of about 52.5 kw hours per month. The cost of high-line service at the same monthly consumption rate is estimated at 15.6 cts.

Analysis of rural line costs (*Elect. World, 100 (1932), No. 15, pp. 507–510*).—An analysis is presented of the costs of more than 700 miles of rural electric lines built in New York State during the past two years. The total number of extensions was 457, having an average length of 1.54 miles. The number of miles analyzed represents about 35 per cent of the normal rural line construction in the State for one year.

The weighted average cost of the primary and secondary line construction, exclusive of transformers, services, and meters, was found to be $1,430.40 per mile. The corresponding total cost per mile was $1,806. As a result of conditions encountered, lines built to the same general specifications varied widely in cost, particularly when compared on a mileage basis. The average number of customers per mile was 5.1, and the weighted average cost per mile represented an investment of about $280 per customer in excess of the normal investment per customer in the urban centers. The cost of right of way and clearing varied from nothing to $124 per mile. The cost of poles and fixtures aggregated about 55 per cent of the total cost. The average cost of labor and materials for the poles and fixtures was $38 per pole, and the cost of the poles alone represented about 20 per cent of the cost of the entire line.

Electric soil and hotbed heating, H. Beresford (*Idaho Sta. Circ. 68 (1932), pp. 26, figs. 19*).—The results of studies conducted by the station, in cooperation with the Idaho Committee on the Relation of Electricity to Agriculture, on electric soil and hotbed heating are briefly reported and deductions therefrom presented in the form of practical information and instructions.

It has been found that the advantages of heat obtained from an electrical source are that the installation may be made permanent, and that temperature may be maintained and regulated automatically to the needs of any particular plant. These features permit the forced growth and early maturity of spring vegetables suited to hotbed planting.

The fact that electrically heated hotbeds are permanent, a feature which saves considerable labor when compared with the manure-type beds, makes the installation and operating cost of the electric beds compare favorably with any other source of heat. It is also possible with electric heat to control the air and soil temperature ratio. The satisfactory growth of plants and the assurance that beds are protected from freezing temperatures are also important features of electrically heated hotbeds.

It was found possible to heat soil in garden plats not protected by hotbed frames in order to force the growth of flowers or garden crops. The saving in energy costs made possible by the protection of the hotbed frames, as well as the more rapid growth of the plants, indicated that electric soil heating is more economical when installed in the hotbed frames.

A 6 by 6-ft. frame is the smallest size that can be adapted readily to the soil-heating wire because it is necessary to use about 60 ft. of wire on the standard 110-v circuit. This size of bed requires two standard 3 by 6-ft. sash, each of which is supplied with 30 ft. of wire, having a capacity of 200 w per sash, or a total of 400 w for the 6 by 6-ft. frame.

Methods of supplying electric heat to hotbeds, T. M. Currence (*Minnesota Sta. Bul. 289 (1932), pp. 19, figs. 11*).—Results of a comparison of four electrical heating combinations for hotbeds indicated that any of them will provide sufficient heat even in very cold weather. The use of current, however, is markedly increased by lower outside temperatures.

Radish and lettuce plants grown during the period from February 8 to March 20 attained the largest size in sections that were supplied with artificial light, but the current used was greater. The current required to raise the air temperature of the frames a certain number of degrees above the outside temperature was less in the two frames that had no electric lights, but this is not deemed an entirely satisfactory comparison since light may often be the limiting factor in plant growth.

The spring experiment covered the period between March 21 and April 30. The amount of current required for germination of the four crops planted was least in the frames where heat was applied in the soil.

The growth of the plants was best in the sections equipped with lights, suggesting the possibility of combining heating with lighting. The lighted beds gave the smallest current requirement per unit of growth for all crops except peppers, which responded about the same to all treatments.

Three growers of vegetable plants furnished certain observations which show chiefly that heating with cable is satisfactory and not expensive. Costs from the three show an average of approximately 95 cts. per sash for 31 days.

Electricity on the poultry farm, L. J. Smith and H. L. Garver (*Washington Col. Sta. Pop. Bul. 148 (1932), pp. 71, figs. 30*).—This is the ninth of a series of bulletins dealing with the use of electricity on the farm and prepared by the station and the Washington Committee on the Relation of Electricity to Agriculture. Its purpose is to present in useful form such practical information on the uses of electrical energy on the poultry farm as have been made available by the different experiment stations and others. In essence, therefore, it is a summary of data, papers, and reports from various sources dealing with poultry house lighting, lighting schedules, dimming devices, types of controls, the use of ultra-violet light, candling eggs, electricity for feed appliances, incubation, electric brooding, types of brooders, electric brooding suggestions, control of cannibalism, water heating, a poultry semiscalder, ventilation, refrigeration, wiring, yard lighting, and burglar alarms.

Artificial light and plant growth, J. M. Arthur (*Agr. Engin., 13 (1932), No. 11, pp. 288–291, figs. 5*).—A brief summary is given of studies with different types of lamps and other artificial illuminating sources which were conducted at the Boyce Thompson Institute.

It was found that ultra-violet beyond the limit for sunlight, that is, of wave length shorter than 290 mμ, is very injurious to plants. The infra-red region is of no known significance to plants except in so far as it serves to increase the temperature of plant, air, and soil. Photosynthesis does not take place in the infra-red region. Only the visible region and the near ultra-violet are used in the process of photosynthesis.

Experiments with incandescent lamps of different illuminating efficiencies on the growth of buckwheat showed that both the green and dry weights of plant tissue produced are approximately the same whether a high or low efficiency lamp is used, provided the lamps are placed at a sufficient distance to give the same foot-candle illumination.

These results indicate that the dry weight of plant tissue produced is closely related to the output of a lamp in the visible region, and increases with increasing efficiency of the light source due to the shifting of the maximum of energy output from the infra-red toward the visible. Considering the increased growth of plants with increasing efficiency of light sources, it is considered very important to choose a source which is as efficient as is consistent with replacement cost of lamps, cost of current, and with practical operation.

Arc lamps are in general more efficient light sources for plant growth, but on account of the difficulty of maintenance have so far not been widely used. Incandescent lamps have too little of the blue-green region as compared with the preponderance of red and infra-red to be ideal light sources for growing plants, yet they are of real service as a practical source for supplementing low-intensity winter sunlight for from 3 to 6 hours each night.

Farm lighting systems, C. A. Logan (*Kans. Engin. Expt. Sta. Bul. 30 (1932), pp. 58, figs. 22*).—The purpose of this bulletin is to give information on the better systems of lighting, to show their probable cost of installation and operation, and to give advice as to their selection, care, and use.

An investigation of the lighting of Kansas farm homes showed that 20,720 out of 166,042 were lighted by electricity. Transmission lines served 10,305

farms, and individual electric plants were found on 10,415 farms. The 32-v, 750- to 800-w plants are the most common sizes of gas-engine electric plants. The battery depreciation was found to be one of the largest single items of expense, and the semiautomatic battery plants were the most economical in the use of fuel. Under the best of conditions it was found that the operation of a refrigerator in connection with an individual electric plant is expensive. Data are also given on acetylene, kerosene, and gasoline lighting on Kansas farms.

[Tractor studies at the Montana Station] (*Montana Sta. Rpt. 1931, pp. 34–36, figs. 2*).—The progress results of studies on tractor loading, carburetor adjustment, and speed and draft are briefly reported.

The elastic drawbar, W. Vutz (*Agr. Engin., 13 (1932), No. 11, pp. 293–295, figs. 9*).—Several devices are described which are in effect shock absorbers on tractor drawbars. They include friction, ring, disk, leaf, and helical torsion springs and hydraulic shock absorbers. It is pointed out that a general application of shock absorbers to tractor drawbars is not feasible at present, and this discussion is merely to provide a basis for rational development.

The operation of power machinery on terraced land, R. W. Baird (*Agr. Engin., 13 (1932), No. 11, pp. 286, 287, figs. 8*).—In a contribution from the U. S. D. A. Bureau of Agricultural Engineering, experience at the Federal soil erosion experiment station at Tyler, Tex., in connection with the operation of power machinery parallel to terraces is described. It appears that plowing and seed-bed preparation are not especially troublesome, but that more serious difficulties are encountered in planting and cultivating.

In general, it was found that one of the additional requirements for the satisfactory operation of tractor machinery on terraces is a greater range of vertical adjustments that can be made by the operator from the tractor seat. This could be obtained quite easily by changes in levers or cranks. More flexibility of the machine is necessary in order that the tools may fit more closely the cross section of the terrace, and might be obtained by suitable gage wheels or by hinges in the machine that will allow vertical movement controlled by gage wheels. More positive steering might be obtained by a change in wheels and wheel equipment, and a design that permits less backlash when the steering gear becomes somewhat worn. For satisfactory operation on uneven slopes and crooked rows compactness is essential, and might be obtained by placing the wheel and covering devices as close as possible to the other elements of the machine without interfering with their satisfactory operation. Greater care in selecting a width of machine to fit the terraces is also deemed necessary.

A test of a new type of force-feed cereal drill, C. Davies (*Jour. South-east. Agr. Col., Wye, Kent, No. 30 (1932), pp. 102–109, fig. 1*).—Results of laboratory and field tests of a special type of force-feed drill are reported.

The machine had 14 colters, 6 in. apart, and was mounted on two 48-in. wheels, one of which drove the feed mechanism. Seven openings were provided in the back of the hopper, each of which was variable in size, being controlled by a sliding shutter. The feed mechanism consisted of a vertical rotating iron cone, which also had an up and down motion. There were seven feeds, one being placed opposite each shutter, and each feed fed grain to two colters.

The laboratory tests showed that the intercolter performance could be improved by adjustment of the mechanism, and that further improvements could be obtained with additional devices. The quantities of grain ejected decreased with increases in drill speed. Uneven fields adversely affected the even de-

livery. No superiority of performance along rows was observed over other force-feed drills.

Studies in soil cultivation.—V, Rotary cultivation, B. A. KEEN ET AL. (*Jour. Agr. Sci.* [*England*], *20 (1930), No. 3, pp. 364–389, figs. 4*).—In studies conducted at the Rothamsted Experimental Station comparisons were made of rotary and ordinary cultivation over a series of years under field conditions.

The rotary machine was a type commonly used for cultivation in orchards, market gardens, and commercial glasshouses, and consists essentially of a 5-h. p. engine mounted on and geared to two drive wheels, with a transverse horizontal shaft at the back, also driven by the engine. This milling shaft carries 12 radial tines, 6 on each side on the central line of the machine and disposed symmetrically about the shaft. The rotation speed of the milling shaft is about 150 r. p. m.

The outstanding feature of the 4 years' experiments on rotary cultivation for preparing a seed bed for spring-sown crops is the contrast between the beginning and the end of the growth period. Practically without exception, quicker and better germination and more rapid early growth followed this method of cultivation, also without exception this initial advantage was either lost or replaced by a reduced yield at harvest. The barley crop gave equally good yields under various soil cultivation treatments. The swede crop did not do so well under rotary cultivation, in spite of better early growth.

It was found that meteorological factors exercise a predominating influence on the physical condition of the soil, and that the influence of the implement is secondary. The rotary cultivator was most effective on tough and sticky soils in that in a wet and open winter it produced a smaller proportion of large lumps. It did not produce an appreciably finer tilth than the usual implements, as indicated by measurements of soil pulverization, but it left the soil in a much looser condition, thus encouraging the earlier germination of seeds. The looser tilth became more compact with time, resulting in the disappearance of the initial advantage of rotary cultivation. A further comminution of the soil was produced when a ridging body was attached behind the rotary cultivator.

The cultivation experiments of 1929–1931, C. DAVIES (*Jour. Southeast. Agr. Col., Wye, Kent, No. 30 (1932), pp. 97–101, figs. 4*).—Studies conducted at the South-Eastern Agricultural College of the University of London are reported in which seed beds for cereals were prepared by the rototiller, pulverator, digger plow, and general-purpose plow.

The yield data show that the finer the tilth the greater the tillering, up to a certain point, after which the death rate was higher. In effect, the finest tilths produced the lowest yields. The pulverator produced results similar to those of the rototiller, although the yields were not quite as low. The use of the general-purpose plow throughout resulted in the production of larger crops than the use of the digger plow.

Studies of consolidation showed that the looseness of the tilths produced by the rototiller and the pulverator, which were noticeable immediately after preparing the soil, disappeared after drilling and harrowing. The coarse tilth prepared by the general-purpose plow seemed to suit cereals better than those produced by the other plows. The tilths produced by digging with a spade and with a fork did not result in any differences in yield, and the conclusion is reached that the work done by digging with a fork, although much finer than that produced by a spade, differs from that produced by the milling rotary cultivators.

Studies of methods of grain drying, II [trans. title], Å. Åkerman and J. E. Lindberg (*K. Landtbr. Akad. Handl. och Tidskr., 71 (1932), No. 3, pp. 233–256, figs. 2; Eng. abs., pp. 255, 256*).—Studies conducted by the Royal Agricultural Academy of Sweden in cooperation with the Swedish Association of Agricultural Engineers are briefly reported in which a comparison was made of the drying of wheat brought together in Dutch shocks and wheat brought together in large perches in which from 10 to 16 bundles are placed around a stake and 8 others are hung upon the stake. It was found that the latter method offers an effective protection against unfavorable harvesting conditions and is preferable to the Dutch shock method. It is also cheaper in labor cost. The greatest value of the perching method consists in its protection against germination. The flour from wheat cured in perches had a superior baking quality to flour from wheat cured in Dutch shocks.

Inexpensive silos for Kansas, J. W. Linn, W. G. Ward, and D. M. Seath (*Kans. State Col. Ext. Circ. 94 (1932), pp. 14, figs. 17*).—This bulletin deals principally with the planning and construction of the trench silo and gives some practical information on pit, bundle, and crib silos.

Wind-resistant construction for farm buildings, M. C. Betts and W. Ashby (*U. S. Dept. Agr. Leaflet 87 (1932), pp. 6, figs. 6*).—Practical information is given on foundation construction, wall bracing, floor construction, and roof anchorage.

The durability of prepared roll roofings, H. Giese, H. J. Barre, and J. B. Davidson (*Iowa Engin. Expt. Sta. Bul. 109 (1932), pp. 59, figs. 46*).—Studies conducted in cooperation with the Iowa Agricultural Experiment Station are reported the purpose of which was to determine quality factors of 3-ply prepared roofings as they were sold on the market during 1913.

One square of each of 35 brands of prepared roll roofing made by 19 manufacturers was included in the experiment. The tests were divided into two groups, the first of which was to determine the durability of the brands of prepared roofing by subjecting them to actual weather conditions, and the second involving tests for such properties or qualities as were considered to influence durability. The results were subjected to correlation analysis.

The results of the weathering tests showed that the average durability of the samples laid on the south side of the roof was 10 years in contrast to over 13.5 years for the same samples on the north side. Their ranges in durability were from 5 to 14 and 5 to 18 years on the south and north sides, respectively. The weathering tests revealed that the sun is the most destructive weathering agency, and that wind becomes very destructive once the roof is loosened sufficiently to permit flapping. The smaller and flat particles of the mineral surfacing were retained much better than the larger and round particles, the latter soon being lost if applied in too large a quantity. The application of an asphalt roof paint added considerably to the useful life of the roofing.

It was found further that the durability of prepared roll roofing increases with the tensile strength of the felt, decreases with the loss of heat due to volatilization of the original material, and increases with the amount of mineral surfacing on the roofing. The close relationship of mineral surfacing to durability was evidenced further by the fact that both the weight and the percentage of ash of original material showed a significant correlation with durability.

Dairy barn ventilation, L. G. Heimpel (*Macdonald Col., McGill Univ., Farmers' Bul. 5 (1932), pp. 43, figs. 14*).—The results of studies over three winters of the performance of the ventilation systems in 15 dairy barns near Montreal are reported. Only natural draft ventilation was investigated.

The studies included observations of outside and inside temperatures, the latter being taken at ceiling level, at floor level, and at mid-height; anemometer measurements of the velocity of the out-going air in the outtakes which, together with the cross-section area of the flue apertures, permitted the calculation of the rate of air change; relative humidity determinations, a measure of efficiency in that it is an indication of the purity of the air in the stable; and air-movement studies made by the use of white smokelike fumes.

The conclusion is drawn that multi-outtake flues are unnecessary. Satisfactory ventilation can be secured with only a single outtake for even very large stables. Under normal winter weather conditions the passing of about 50 cu. ft. of air per minute per animal unit (1,000 lbs. live weight) through a stable is sufficient to maintain very good air conditions.

The circulation of stable air is controlled and caused by the animals housed in it more than by the ventilation system. As soon as the air comes in contact with an animal it is warmed and immediately rises to the ceiling, and, in order to replace air thus moved, some cool air flows along the floor to be warmed and sent to the ceiling in turn. Where cattle are stabled in rows, therefore, there is a continual strong convection current from the cattle to the ceiling, along the ceiling to the nearest cold wall, then down the wall and across the floor back to the animal. Usually there are also present other convection currents, at right angles to those from the cattle to the nearest cold wall, in which there is usually a strong movement of air along the floor in one direction and along the ceiling in the opposite direction.

Outtake flues do not cause harmful drafts. There is of course a slow movement or gravitation toward the outtake which is not noticeable at distances over 2 ft. from the opening. While concentration of outtake has no harmful effect, concentration of intake is very harmful. Intake flues must be distributed around the stable in order to prevent drafts and to produce good distribution of incoming air.

The amount of air a given ventilation system will pass through a stable is controlled by the capacity of the outtake. No more air will come in at the intakes than is necessary to replace that removed by the outtake. Floor outtakes, or the type used in the King system of ventilation, do conserve considerable stable heat over that conserved by ceiling outtakes (Rutherford type) for a given amount of air handled.

Regardless of the type of system, the single outtake system has been proved to be vastly superior, both in performance and economy, to systems having a number of outtake flues and ventilator heads on the barn roof.

Practical information is given on the planning and construction of the single outtake King system of ventilation and on the regulation of the system.

Rural fire waste in Iowa, 1930–31, H. Giese and E. D. Anderson (*Iowa Sta. Bul. 296 (1932), pp. 221–258, figs. 16*).—The results of an investigation to determine methods of reducing rural fire waste in Iowa are reported in this bulletin.

The rural fire loss in Iowa for 1931 was less than for 1930, although the trend for the State as a whole has been upward since 1928. Country losses were largely total. While the number of fires in the country about equaled that in towns, the property damage was 88 per cent greater. Eight per cent of the country fires were group fires, causing only about 14 per cent of the total loss. This is taken to indicate that a program depending largely upon the saving of buildings in the farmstead other than the one in which the fire originates does not offer a very promising means of reducing fire loss. The greatest losses were to dwellings and barns, the ratio being 2:1.

Of the known causes, sparks on roofs and defective flues were the largest items in dwelling fires, while spontaneous combustion of hay and straw and lightning on nonrodded buildings were responsible for the major amount of barn losses. The greatest losses occurred during the first quarter of the year, and fire losses were rather uniformly distributed throughout the 24 hours of the day. Country losses were almost equally distributed between owner and tenant occupied buildings and proportional to the actual distribution of tenancy.

AGRICULTURAL ECONOMICS

[Readjustments in organization for production in view of the outlook for agriculture] (*Jour. Farm Econ., 14 (1932), No. 3, pp. 406–452*).—Included are papers read at the twenty-second annual meeting of the American Farm Economic Association, previously referred to (E. S. R., 67, p. 469), dealing with general readjustments by C. L. Holmes (pp. 406–428) and readjustments for southern agriculture by G. W. Forster (pp. 429–432), for the Corn Belt by H. C. M. Case (pp. 433–441), for the Northern Great Plains Area by S. E. Johnson (pp. 442–446), and for New England by H. C. Woodworth (pp. 447–452).

How California agriculture profits by economic research, H. R. Tolley (*Berkeley: Univ. Calif. Press, 1932, pp. 23*).—The accomplishments of the Giannini Foundation (E. S. R., 58, p. 602) since its establishment in 1928 are reviewed at length. The commodities studied from the marketing viewpoint were milk, eggs, honey, livestock products, field crops, and fruit, including raisins, oranges, prunes, pears, grapes, avocados, and canned fruits. Other research helpful to growers included historical studies in cooperative marketing, farm management and costs, land utilization, agricultural finance and taxation, the economic influence of quarantines, and the functions of farm groups.

The recommendations of the foundation, based upon research, and resulting economic improvements in California agriculture are set forth.

[Investigations in agricultural economics at the Ohio Station] (*Ohio Sta. Bimo. Bul., 18 (1933), No. 1, pp. 20–27*).—Investigations are reported on as follows:

Prices of cattle and hogs compared with wholesale and retail prices of beef and pork, G. F. Henning and J. J. Anderson.—Tables are included and discussed showing the estimated amounts received and the index numbers (1927=100) of such amounts (1) by farmers for a 900-lb. steer, by wholesalers for the beef from such steer, and by retailers for 5 cuts (sirloin and round steak, rib and chuck roast, and beef plate) from such steer, and (2) by farmers for a 200-lb. hog, and by wholesalers and retailers for 4 cuts (pork chops, sliced bacon, sliced ham, and lard) from such hog, by years 1927–1931, and by months January to September, 1932.

Index numbers of production, prices, and income, by J. I. Falconer.—The table previously noted (E. S. R., 68, p. 545) is brought down through October, 1932.

[Investigations in agricultural economics at the South Carolina Station, 1931–32] (*South Carolina Sta. Rpt. 1932, pp. 9–15, fig. 1*).—Results of investigations are reported as to farm organization and management in the Orangeburg area by W. C. Jensen, B. A. Russell, and C. Gunnells (pp. 9, 10), in which data are included showing the direct relationships between operator's earnings and both acreage of crops and farm expenses, and the average costs of producing cotton and other crops in 1930; cotton marketing, by Jensen, M. Guin, and H. A. White (pp. 10–12), dealing with the staple lengths, grades,

and tenderability of South Carolina cotton in 1931, buying practices in the local markets, and the demands of South Carolina cotton mills; a study of the methods and price factors in marketing South Carolina hogs, by Guin (pp. 12, 13); and a study of the production and distribution of farm commodities in Sumter County, by Jensen, Russell, and Guin (pp. 13–15).

[Ranch and farm management investigations at the Wyoming Station, 1931–32] (*Wyoming Sta. Rpt. 1932, pp. 7, 8*).—Four types of farming advised for lands under the Sidon Irrigation Canal in the northern part of the State are outlined and the estimated labor incomes compared with the average in 1930 for 63 farms under the canal.

[Investigations in farm management at the Michigan Station 1930–1932] (*Michigan Sta. Bien. Rpt. 1931–32, pp. 34–40*).—Results of investigations not previously noted are reported as to the cost of producing Michigan beans and pullets, lamb feeding records, variations in horse labor efficiency between tractor and nontractor farms, variations in earnings between neighboring farms, and changes in farm organization and operation in the corn-producing sections of southeastern Michigan.

The opportunity cost basis of the substitution method in farm management, M. R. Benedict (*Jour. Farm Econ., 14 (1932), Nos. 3, pp. 384–405, figs. 5; 4, pp. 541–557, fig. 1*).—These articles do not "undertake a comparison of farm cost concepts, but rather to present the cost theory basis for the 'substitution' or 'synthetic' method of farm management study, at the same time pointing out incidentally the relationship of this to certain of the more orthodox types of cost treatment." The first article discusses "the nature of certain costs, or resistances to production, which grow out of the fact that the farm entrepreneur may use his limited resources in various alternative ways." The second considers "what possibility there may be of a fuller recognition of these and other cost relationships in the actual process of research in farm management."

A farm management survey of Tioga County, Pennsylvania, J. E. McCord (*Pennsylvania Sta. Bul. 282 (1932), pp. 31, fig. 1*).—This study was made in cooperation with the Bureau of Agricultural Economics, U. S. D. A., to obtain information on farms in areas containing some supposedly marginal and submarginal land, with a view of determining the present economic status of farming and the possible and probable future trend of the industry. Usable records of complete operations on the farms for one year were obtained by field men from 582 farms, about one-fifth of the farms in the county. The agricultural conditions, geology, and soils of the county are described, and the factors concerning family living are discussed. Analysis is made of the effects on labor income of soil, size of business, crop yields, livestock production, balance in the farm business, age of operator, use of tractors, efficiency in the use of labor and equipment, and ownership and tenancy.

The average total investment per farm was $8,180, and the average gross receipts and expenses were $2,257 and $1,401, respectively. Allowing 5 per cent interest on investment, the average labor income was $447, in addition to a house to live in and $340 worth of farm products for use by the family. Of the 582 farms, 158 had minus labor incomes, 35 being minus by $600 or more, while 207 had plus incomes exceeding $600, those of 8 being more than $3,000.

There was close correlation between labor income and size of the livestock industry on the farms. Dairy cattle and poultry were the most important kinds of livestock. Location of the farm as regards soil types was very important, but perhaps not so important as the farmer being a good dairyman. The farms with either acres in farm, acres in crops, productive men work

units, number of cows in the herd, man equivalent, or capital invested somewhat above the average made the more satisfactory incomes. A combination of crops and livestock that would use equipment and labor to the greatest advantage was very important, and it was found that not over 10 per cent of the gross income should come from the sale of crops. On an average, 5 acres of pasture was needed to carry an animal unit, and 4 acres of crops were produced per animal unit. Farmers who improved their pastures so that 2.5 acres would carry an animal unit, or who kept 1 animal unit per 2 acres of crops, found it profitable. Yields of ordinary field crops 40 per cent above the average and of intensive crops, such as potatoes, 100 per cent above the average were found to be most profitable. High-producing livestock was more important than very high crop yields. Farms so organized that from 70 to 80 per cent of the total income was from the sale of livestock products had the most profitable organization. Knowledge acquired through experience apparently had little value, the best average labor incomes being for the group of farmers under 30 years of age.

Farms using tractors were larger and had more acres in crops and better yields per acre, but had fewer acres of crops per horse equivalent and only $6 better labor incomes. The best labor incomes were made by the farmers having a larger than average business, a good balance between crops and livestock, better than average crop yields and livestock production, and the greatest efficiency in the use of man labor and horse work. On an average, the farmers had farmed 17.9 years and had an annual increase in wealth of $313, or 4 per cent on the average investment. The average labor income of tenant farmers was $588 and that of owner operators $380. Share renting was more profitable to the tenant than cash renting.

Some economic problems of the Montana farm (*Montana Sta. Rpt. 1931, pp. 59–70, fig. 1*).—Results obtained at the dry-land farms are briefly noted on reducing the cost of summer fallow by improved machinery, increasing efficiency by improving the farm and ranch organization and revising cropping systems, and the relation of the productivity of land to the size of the farm unit.

South Carolina agriculture: A statistical report (*South Carolina Sta. Statis. Bul. 1 (1931), pp. 40, figs. 3*).—This is the first of a series of statistical reports on phases of the agricultural industry of South Carolina. The data presented in this bulletin are taken from reports of the Bureau of the Census, U. S. Department of Commerce. Charts are included showing, by counties, for 1920 and 1930 the percentages of crop acreage harvested in different crops and the number of cows, hogs, and cattle for 100 acres.

Tables show, by counties, for the years covered by the 1880 to 1930 United States censuses the number of farms, white farmers, and colored farmers; acreage in farms; acreage of improved crop land; value of land and buildings; acreage and production of cotton, corn, oats, tobacco, potatoes, and sweetpotatoes; acreage of wheat, rye, and hay; number of peach and apple trees and production of peaches and apples; number of work stock on farms, dairy cows, hogs, sheep, and chickens; value of livestock and machinery on farms; and the total cost of fertilizer.

Agricultural credit, A. J. Boyazoglu (*London: P. S. King & Son, 1932, pp. XXXIV+267*).—The treatment of this subject is exhaustive and largely theoretical but not without practical significance.

Farm tax revision by recent State legislatures, B. W. Allen and D. Jackson (*Jour. Farm Econ., 14 (1932), No. 3, pp. 480–488, fig. 1*).—Recent revisions in tax legislation are interpreted from the standpoint of the farm taxpayer.

American tobacco types, uses, and markets, C. E. Gage (*U. S. Dept. Agr. Circ. 249 (1933), pp. 88, pl. 1, figs. 38*).—The various types of American-grown tobacco and their uses are described with tables showing for a number of years the acreage, production, prices, exports to leading countries, stocks on hand October 1, disappearance during the year beginning October 1, etc. Other tables included and discussed show the market outlets and, by years, the number of cigars and cigarettes and the pounds of chewing tobacco, smoking tobacco, and snuff manufactured in the United States; the quantities of tobacco and other materials used in the manufacture; the consumption per capita of manufactured tobacco products; the exports of leaf tobacco, by types, and of manufactured tobacco products; the imports of leaf tobacco and manufactured tobacco products from foreign countries and shipments from possessions; reexports; etc.

The methods used by growers in disposing of their tobacco and the United States tobacco standards are briefly summarized. Tables and charts are included showing the approximate marketing season for the different types of tobacco, the internal revenue received from different tobacco products, and the number of cigar manufacturers. The tobacco grading service of the Bureau of Agricultural Economics and the sources of statistics on tobacco are briefly described. A colored map shows the tobacco-producing districts of the United States.

This circular supersedes a bulletin previously noted (E. S. R., 28, p. 235).

Corn and hog surplus of the Corn Belt, A. E. Taylor (*Food Res. Inst. [Stanford Univ.] Misc. Pub. 6 (1932), pp. XXI+658, pl. 1, figs. 20*).—The agrarian problems of the Corn Belt are recognized as the most typically American. Declines in the price level and land values are found to be quite as conspicuous in the Corn Belt as elsewhere. The outlook for the next decade depends on the trends of production, consumption, substitution, and the price level at home and abroad. Both domestic and international factors influencing the outlook are discussed. Some of these factors are agricultural, while others are derived from political, monetary, and industrial influences.

The book is divided into two parts. Part 1 deals with the nature, extent, and consequences of a surplus of corn and hogs, and part 2 deals with the amelioration of the consequences of this surplus. The discussion of the corn and hog surplus invites reflection upon the entire agricultural situation and various forms of farm relief.

The marketing of farm products, L. J. Norton and L. L. Scranton (*Danville, Ill.: Interstate Ptg. Co., 1932, 1. rev. ed., pp. [8]+384, figs. 10*).—This is a textbook for the use of students and teachers of vocational agriculture in the study of marketing. The general aim is to consider the problems of marketing from the standpoint of the individual farmer. Each chapter includes a general discussion of the underlying theory or a description of the facts involved in the subject under consideration, and problems, the answers to which involve the working over of the descriptive or analytical discussion, and the application of the material to concrete local problems.

Part 1, the farmer and his market, includes chapters on marketing functions and agencies and adjusting production to market demands. Part 2, the principles of price determination, deals with using current price and market information, how and where prices are determined, and the comparison of prices. Part 3, the principles of cooperative marketing, includes chapters of the aims and values of cooperative marketing, the development of cooperative agricultural organizations in the United States, the organization of a cooperative

association, and the essentials for success in cooperatives. Part 4, commodity marketing—livestock, deals with the areas of production and the classification and grading of different kinds of livestock, the location of the principal markets in the United States, the selection of a method of marketing, marketing services and costs, seasonal fluctuations in prices, long-time cycles, trends, and short-time fluctuations in prices and production, how to keep informed as to production trends, and the relationships between livestock and grain prices. Part 5, commodity marketing of grain, deals with the sources of supply, market classes and grades, and the seasonal price fluctuations and storage problems of the principal grains, and crop reports and forecasting. Part 6, commodity marketing of other products, deals with dairy products, eggs, poultry, and potatoes. Part 7 includes chapters on governmental assistance on marketing problems, and the Federal Farm Board and cooperative marketing.

Marketing in practice, in research, in teaching (*Natl. Assoc. Marketing Off. Proc., 13 (1931), pp. 80*).—This is the proceedings of the thirteenth annual meeting of the National Association of Marketing Officials held at Washington, D. C., in December, 1931. Included, besides the reports of the committees and of the business session, are the following papers: Trends in the Export Market Situation, by E. G. Montgomery (pp. 5–9); Progress in the Work of the Federal Farm Board, by J. C. Stone (pp. 9–11); Functions and Responsibilities of State Marketing Agencies, by S. A. Edwards (pp. 11, 12) and by L. M. Rhodes (pp. 12–15); The Grange League Federation Exchange, Its Organization and Plan of Operation, by J. C. Crissey (pp. 15, 16); A National Marketing Research Program for Agriculture, by N. A. Olsen (pp. 16–22); Value of Marketing Research to the Consumer, by F. V. Waugh (pp. 23–27); Types of Research Required in Developing Marketing Programs, by T. Macklin (pp. 27–31); The Place of Marketing in an Agricultural Economics Curriculum, by O. B. Jesness (pp. 31–34), discussed by L. Spencer (pp. 35, 36); Content and Organization of a Course in Principles of Marketing, by H. E. Erdman (pp. 36–39), discussed by S. H. DeVault (pp. 39–43) and by P. L. Miller (pp. 43–45); To What Extent Should Price Economics Be Included in Marketing Courses? by F. L. Thomsen (pp. 45–48), discussed by J. G. Knapp (pp. 49–51); Origin and Development of Farm Economics in the United States, by G. F. Warren (pp. 51–56) (E. S. R., 67, p. 469); Origin and Development of the Office of Farm Management in the U. S. Department of Agriculture, by E. H. Thomson (pp. 56–60) (E. S. R., 67, p. 469); Origin of Farm Economics Extension, by C. B. Smith (pp. 60–63) (E. S. R., 67, p. 469); and Some Developments in the Administration of the Perishable Agricultural Commodities Act, by C. W. Kitchen (pp. 63–68).

Bibliography on the marketing of agricultural products, compiled by L. O. Bercaw and E. M. Colvin (*U. S. Dept. Agr., Misc. Pub. 150 (1932), pp. IV+351*).—This classified and annotated bibliography supplements that previously noted (E. S. R., 53, p. 91) and covers approximately the period 1924–1931. No attempt has been made to cover the field of statistics, mimeographed publications, periodical articles, short items in the Yearbooks of the Department, reports of marketing bureaus or divisions under State departments of agriculture, or material on the artificial coloring and ripening of fruits and vegetables.

Supply and marketing of soybeans and soybean products, C. L. Stewart, W. L. Burlison, L. J. Norton, and O. L. Whalin (*Illinois Sta. Bul. 386 (1932), pp. 425–544, figs. 29*).—"The purpose of the present study has been to examine the supply situation with respect to both soybeans and soybean products, the present and potential markets for soybeans, the means and methods by which

they are marketed, their economic characteristics in relation to improvements in marketing, and the influence of various factors on the prices paid for them."

The production of soybeans in Illinois, the United States, and the leading producing countries of the world; the imports into and the exports from the United States and selected countries of soybeans and soybean products; the supply of soybean oil and competing oils and fats; the utilization of soybeans and soybean oil and oil meal; the marketing practices and the elements of cost in marketing; the inspection system and soybean grades; the prices of seed beans and soybean oil and oil meal; and the use of the products as affected by prices are discussed with statistics covering a number of years. The varieties of soybeans grown in Illinois and the place of soybeans in Illinois farming are also discussed, and data are given as to the cost of production and returns in Illinois and in Indiana during the period 1921–1930.

Motor truck marketing of Michigan fruits and vegetables, G. N. Motts (*Michigan Sta. Spec. Bul. 227 (1932), pp. 47, figs. 3*).—This bulletin describes the present status of the motor transportation of Michigan fruits and vegetables with particular reference to the volume and points of origin and destination of motor truck movements; the part taken by growers, dealers, truckmen, truck carriers, and jobbers in such movements; the operating methods of truckmen and truck carriers; and the advantages and disadvantages of motor transportation to each of the marketing groups; and analyzes the changes suggested by the marketing groups for the improvement of such transportation. The data upon which the analysis is based were gathered during the year ended July 31, 1932, in various sections of the State from growers, dealers, cooperative organizations, truckers, truck carriers, jobbers, retailers, market officials, etc. Additional data were obtained from the Michigan Departments of State, Agriculture, and Highways, departments of the Michigan State College, trade journals, State and Federal publications, and other sources.

It is estimated that truck movements of Michigan produce total about 27,000 carloads per year. About 80 per cent of all produce in the southwestern part of the State and practically all potatoes from the south end of the State move to market by truck. The percentages decline steadily to the north. The average haul by truckers of fruits is 130 miles, and that of trucking companies 160 miles. The average haul for potatoes is about 80 miles.

The typical trucker of fruits and vegetables has trucked for 5 or 6 years, operates a 1.5-ton truck, has a helper, visits certain markets 3 or 6 days a week for 9 or 10 months during the year, and drives about 30,500 miles during the year without return loads. About 95 per cent of the tonnage handled is Michigan grown and is valued at $65 to $160 a load. About 48 per cent of the tonnage is bought at farms, 48 per cent at public markets, and 4 per cent elsewhere. If fruits and vegetables are handled, about 33 per cent of the tonnage is sold to grocers and restaurant operators, 25 per cent to jobbers, 20 per cent to hucksters, 20 per cent to consumers, and the balance to chain stores and other truckers. If only potatoes are handled, about 70 per cent is sold to grocers and restaurants, 2 per cent to jobbers, 10 per cent to hucksters, 15 to 20 per cent to consumers, and the balance to chain stores and other truckers.

The typical truck carrier has operated about 8 years, owns from 2 to 40 trucks, rents from 1 to 65 trucks during the peaks of a 5-months season, has 2 men per truck, operates its trucks about 36,500 miles during the season, and hauls for growers, dealers, and cooperatives to wholesalers, jobbers, and chain stores.

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The gross margins of truckers are about equal to or less than rail rates. The truck carrier rates are higher than rail rates on produce not requiring icing and less than rail rates plus icing charges on more perishable produce. Neither rail nor truck transportation is the cheaper or more desirable under all conditions. The most serious difficulties of the truckers and truck carriers are those due to fly-by-night trucking, grades and grade enforcement, governmental fees and regulations, and the competition with other truckers and truck carriers.

Recommendations for the improvement of marketing by truck include among others the following: (1) The adoption of United States grades for fruits and vegetables; (2) more effective grade enforcement; (3) a more effectively enforced license system for truckers; (4) more widespread participation in existing carrier organizations; (5) better operating methods on the part of truck operators, including such things as adequate financial resources, accurate figuring of costs, handling of produce that can be guaranteed, regular trips, etc.; (6) patronage only of dependable truckers; and (7) enlargement of sales of graded produce by cooperative associations and dealers at packing houses to truckers or increase in the use of truck carriers if within economic trucking distance to market. The use of joint contracts with truck carriers by associations within a county or similar area and agreement to furnish as many return loads of supplies as possible is also suggested as a method of obtaining lower rates.

American fruit and vegetable auctions, J. W. PARK (*U. S. Dept. Agr. Circ. 250 (1932), pp. 48, figs. 9*).—This circular is prepared with a view to acquainting shippers, growers, and others with the methods and extent of operation of fruit and vegetable auctions in the United States. It is based largely on and supersedes the bulletin previously noted (E. S. R., 54, p. 484). It relates mainly to the auctions ("delivered auctions") which sell fruits and vegetables after their arrival in the large city markets, but a brief discussion is also included of the auction sales in producing districts and f. o. b. auction sales conducted by means of a leased-wire system linking up a number of markets. The statistics on city auction sales are brought up to date, the development of auction selling during recent years is traced, and the operation of the auctions and their position in the distributing machinery are described.

A bibliography is included.

Carload shipments of livestock from North Dakota farms, A. H. BENTON (*North Dakota Sta. Bul. 262 (1933), pp. 15, figs. 6*).—The data included are based on reports of railroads traversing the State, statements of packing plants operating in the State, and the releases of the Bureau of Agricultural Economics, U. S. D. A. Tables and charts are given showing for cattle, hogs, and sheep, by years 1920–1932, the number on North Dakota farms on January 1, and for 1920–1931, by counties and crop reporting districts and for the State, the carload shipments of cattle, hogs, and sheep. The percentage of the total shipments for the State that were shipped by truck are given.

Factors affecting the prices of livestock in Great Britain.—A preliminary study, K. A. H. MURRAY (*Oxford: Univ. Oxford, Agr. Econ. Res. Inst., 1931, pp. VII+180, figs. 70*).—Analysis is made for cattle and beef, sheep, mutton, and lamb, and pig and pig products of the consumption; the changes in amounts and kinds of and in cyclical fluctuations and seasonal variations in the home-produced supply; the amounts, types, sources of, and seasonal variations in the imported supply; the long-time movements, short-time fluctuations, and seasonal variations in prices; and the relation of supply to and its effect on prices. Appendixes include tables showing data as to the supplies and prices

of the different kinds of livestock and livestock products, an explanation of the statistical method used, and a table giving the equations of supply-price curves determined in the analysis.

Report of the reorganization commission for pigs and pig products, G. R. LANE-FOX ET AL. ([*Gt. Brit.*] *Min. Agr. and Fisheries, Econ. Ser. 37 (1932), pp. 108, figs. 2*).—This commission was appointed April 21, 1932, in accordance with Section 15 of the Agricultural Marketing Act, 1931, and was "charged with the duty of preparing, in accordance with the provisions of the Act, a scheme or schemes (applicable in England and Scotland) for regulating the marketing of pigs and any pig products." The report discusses the position of Great Britain and Northern Ireland as producers of pig meat, the United Kingdom as a consumer of such meat, the problems of the industry, and the principles of the commission's proposals. The recommendations of the commission as to quotas, contracts, pig production and marketing, bacon curing, and cooperation with Northern Ireland are set forth and discussed.

Appendixes include drafts of schemes for regulating the marketing of pigs and of bacon and hams and a selected bibliography on the pig and pig product industries of the United Kingdom.

A study of the demand for eggs in selected chain stores of metropolitan New York, 1929, W. C. WAITE (*Jour. Farm Econ., 14 (1932), No. 3, pp. 373–383, figs. 6*).—The data for this contribution from the Minnesota Experiment Station were obtained from 40 chain stores in 15 areas of the boroughs of Manhattan and Bronx. In making the analysis the stores were divided into 5 groups on the basis of consumer income and the averages for the groups used. Four grades of eggs were considered, grade 1 being a high quality white egg and grade 2 the standard carton egg of the chain stores studied. Tables and charts show the percentage each grade of eggs constituted of the total sales to each income group and the ratios of sales of the various grades to total sales and price differentials.

The study showed that consumers took the same quantity of grade 1 and grade 3 eggs in the high income group when the difference in price was 9 cts. per dozen, while in the low income group with a difference in price of only 4 cts. only 60 per cent as many grade 1 as grade 3 eggs were taken. The same amounts of grades 2 and 3 eggs were taken in the high income group with a price differential of 7 cts. per dozen, and in the low income group with a 3-ct. differential.

As to the general method of approach in such a study, the following conclusions are reached: "(1) The use of invoices of delivery is a serious limitation for commodities for which there is a wide variation in sales or which are delivered to the stores in large units. A special inventory account kept by the dealer is desirable wherever possible. (2) Consumers may be classified successfully by areas for certain important characteristics, but somewhat more information regarding these characteristics is necessary than we have obtained in this study. (3) The differences among consumers in a large metropolitan area are important and may be studied for many commodities through the medium of retail outlets."

Cooperative purchasing and marketing organizations in New York State, F. A. HARPER (*New York Cornell Sta. Bul. 544 (1932), pp. 117, figs. 11*).—This study was conducted jointly with the New York State Department of Agriculture and Markets. In addition, cooperation was extended by the Federal Farm Board in 1930, when the board cooperated with the Northeastern States in a general survey of cooperatives. The objectives were to complete a survey of all cooperative purchasing and marketing organizations in New York State, to

determine their principal needs, and to establish standards for their financing and operation.

Prior to January 1, 1931, 702 farmers' cooperative organizations had been incorporated under the State's cooperative corporations law. Of these, 223 were never active in any respect, 58 were never active commercially, 252 operated commercially for a time, after which they became inactive, and 169 were still active at the end of 1930.

The purchase of supplies increased the chances of continued operation. Of 174 cooperatives organized for the purpose of selling produce and which continued active for a time after their incorporation, only 42 were in operation at the end of 1930. This compares with 131 purchasing organizations, of which 82 were still active at the end of 1930. The purchase of supplies was the principal line of business of more than half of all active cooperatives. Most of their business was in feed. Their membership included about one-sixth of all the farmers in the State.

The cost of operation of feed cooperatives for 1929 amounted to 6.2 per cent of net sales, as compared with an average of 12.2 for 63 privately owned New York feed stores for the year 1926. The size of business was an important factor influencing the success of the cooperatives studied. The average rate of increase in the amount of business of retail feed cooperatives was more than 10 per cent per annum. A liberal credit policy did not accelerate the rate of business increase, but made total cost of operations much higher. In 1929 an annual business of about $90,000 appeared to be necessary for centrally controlled stores to meet operating costs with a margin of 6.3 per cent of net sales.

About one-half of all dairy products sold by New York farmers in 1929 went through cooperative channels. This constituted more than two-thirds of the amount of cooperative business of all kinds in the State. The membership of dairy cooperatives is represented by about one-third of the total number of New York farmers. A relatively small amount of fruits and vegetables was marketed cooperatively. The overhead cost of fruit and vegetable cooperatives would be reduced and their business stabilized if they would handle supplies.

New York cooperatives in general, it is stated, compare favorably with private businesses. They have made important contributions to the agriculture of the State by effecting savings to their members, providing needed services that were not otherwise available, and reducing margins of private dealers.

Recommendations are made for improving cooperative business in the State.

Empire Marketing Board, May, 1930, to May, 1931 ([*Gt. Brit.*], *Empire Marketing Bd. [Pub.] 41 (1931), pp. 75*).—This report, which continues the series previously noted (E. S. R., 63, p. 784), reviews the work of the board during the year and describes and gives results of some of the investigations.

Crops and Markets, [December, 1932, and January, 1933] (*U. S. Dept. Agr., Crops and Markets, 9 (1932), No. 12, pp. 449–520, figs. 3; 10 (1933), No. 1, pp. 32, figs. 2*).—Both numbers include tables, reports, summaries, charts, estimates, etc., of the usual types.

No. 12 also contains the final crop report for the year 1932, which includes for 1930, 1931, and 1932 the estimates of sown acreages of winter wheat and rye and the condition on December 1; summary of the acreage, yield, and production of important crops; total acreage, by groups of crops and by States, of the principal field crops, and acreages harvested, yields, and production, by States, of important field crops; indexes of the mass of crop production, total and per capita, by years 1890–1932; estimated acreage, yield, and production of different truck crops, by years 1928–1932; total acreage of truck crops, by States, 1929–1932, for consumption and for canning and manufacture; acreage,

yield, and production, by States, 1928–1932, of different truck crops grown for market and for manufacture; acreage, by States, 1930, 1931, and 1932, of corn grown for grain, silage, hogging down, grazing, and forage, and the yield and production of that for grain and silage; estimated prices, by States, November 15, 1931 and 1932, of different farm products, with comparison of United States averages with previous years and periods of years; and the average monthly prices of different products, by years, for periods beginning from 1908 to 1915.

Other tables include statistics comparing yields and production of different crops in 1932 with the averages for previous periods of years; data as to the production of maple sugar and sirup, sugar beet pulp, Louisiana sugarcane, sugar, sirup, and molasses; number of persons employed per farm at different dates, 1931 and 1932, by geographic divisions; hog-corn ratios, by months 1910–1932; pounds of milk produced in 1930, 1931, and 1932, and the average, 1925–1929, by cows of crop reporters in different States; number of hens and pullets per farm flock and eggs laid per flock, by geographic divisions, by quarter years and certain months from 1929, 1930, 1931, and 1932, and the average for the period 1925–1929; and the indexes of farm prices of chickens, eggs, and feed for poultry, by months, January, 1928, to November, 1932.

The cotton, pig, lamb, and western livestock and range reports of December 1, 1932, are also included.

Interpretation of the 1930 census of livestock on farms, C. L. HARLAN (*Jour. Farm Econ., 14 (1932), No. 3, pp. 453–469*).—This article discusses (1) the lack of comparability of the figures for the 1930 census and the censuses of 1920 and 1925 due to the change in date of enumeration from January 1 to April 1, and (2) studies made by the U. S. Department of Agriculture to obtain data for use in converting the April 1 figures to a January 1 equivalent.

An agricultural atlas of England and Wales, M. MESSER (*Oxford: Univ. Oxford, Agr. Econ. Res. Inst., 1932, 2. ed., rev., pp. [4]+25, maps 28*).—Maps and tables are included showing for England and Wales, by counties, and for the Channel Islands the acreages for 1928 of mountain and heath land, permanent grass land, arable farming land, and the different crops and land in fallow, the number of different kinds of livestock and poultry, and the number of agricultural laborers. The atlas is based on parish returns supplied by the Ministry of Agriculture and Fisheries. A relief map, a geological map, and an average-rainfall map are also included.

American cooperation (*Washington, D. C.: Amer. Inst. Coop., 1932, pp. XVI+640, fig. 1*).—Included among the following papers presented at the eighth summer session of the American Institute of Cooperation, held at Durham, N. H., August 1–6, 1932, were the following:

The Progress of Cooperatives in the United States Through the Assistance of the Federal Farm Board, by C. Williams (pp. 5–11); The Role of the Cooperative, by A. E. Holt (pp. 11–18); Recent Trends in the Markets in Which Cooperatives Sell, by H. R. Tosdal (pp. 18–33); Motor Truck Legislation, by E. J. Tracy (pp. 36–44); The Services of Richard Pattee to the Agriculture of New England, by A. L. Felker (pp. 49–52); Services of Richard Pattee to the Dairy Cooperative Movement of New England, by G. R. Little (pp. 53–61); The Economic and Social Philosophy of Richard Pattee, by C. W. Holman (pp. 61–69); The Present Status of and Outlook for the Agricultural Cooperative Movement in America, by E. G. Nourse (pp. 69–71); Federal Farm Board Policies with Respect to Nation-wide Cooperative Marketing Organizations, by C. Williams (pp. 77–79); Cooperative Structure and Farm Board Policy, by E. G. Nourse (pp. 80–93); The Grain Marketing Program of the Federal Farm Board, by W. E. Grimes (pp. 93–104); Farm Board Policies with Reference to

Nation-wide Cooperative Marketing of Fruits and Vegetables, by W. G. Meal (pp. 105–114); General Discussion of National Cooperatives and Federal Farm Board, by C. Williams, E. G. Nourse, et al. (pp. 115–143); A Cooperative's Credit Policy as to Commodity and Facility Loans, by J. D. Black (pp. 147–165); Government Facilities for Agricultural Credit, by P. Bestor (pp. 166–175); Operations of the Federal Intermediate Credit Bank of Springfield in the Northeastern States, by E. H. Thomson (pp. 176–182); Effect of Centralization of Ownership of Milk Distributing Facilities over Wide Areas, by H. Hartke (pp. 185–197); Problems Milk Marketing Associations Must Meet, by C. E. Hough (pp. 197–203); Market Milk Problems of California Milk Producers, by J. M. Tinley (pp. 204–216); The Effect of Production Control over a Long Period, by T. G. Stitts (pp. 217–223); Recent Trends and Changes in Markets in Which Cooperatives Sell Products, by G. R. Fitts (pp. 227–231); The Effect on Market Price and Policies of the Widening of Fluid Milk and Sweet Cream Areas, by W. H. Bronson (pp. 233–240) and by H. B. Steele (pp. 241–245); Organization Problems of Marginal and Borderline Territory in Reference to Metropolitan Milk Sheds, by M. C. Bond (pp. 248–255); Centralized Control of Primary and Secondary Markets, by H. H. Rathbun (pp. 255–258), by G. E. Dickson (pp. 261–264), and by F. L. Brown (pp. 265–271); Limitation of Territory Supplying Fluid Milk and Cream Markets, by S. McL. Buckingham (pp. 271–274), by I. W. Heaps (pp. 274–276), and by A. J. McGuire (pp. 277–280); A Survey of the National Situation Relative to the Cooperative Marketing of Poultry and Eggs, by J. J. Scanlon (pp. 283–296); Recent Trends of Marketing Conditions as Affecting Egg Cooperatives, by E. W. Benjamin (pp. 298–309); The Adjustments in Market Policies, by P. L. Betts (pp. 315–319); Adjustment Problems of Poultry Cooperation in the Depression Periods—Finance and Transportation, by H. E. Shackelton (pp. 319–326); Production Program for Cooperative Egg and Poultry Marketing Associations in Times of Depression, by C. C. Edmonds (pp. 327–340); Problems Involved in the Marketing of Eggs by the Auction Method, by R. S. Taylor (pp. 342–347); The Merchandising Plan of the Connecticut Poultry Producers, Inc., by F. O. Miner (pp. 349–353); Changes in Terminal Market Agencies and Practices, by J. F. Deegan (pp. 357–365); Adjustment to Changed Business Conditions by the Citrus Industry, by P. S. Armstrong (pp. 366–372); Services the Fruit Auctions Offer Cooperatives, by A. D. Miller (pp. 372–380); Meeting the Retailers' Requirements, by R. A. Palen (pp. 383–388); F. O. B. Auctions and Country Concentration Points, by A. G. Waller (pp. 389–409); The Effect of Truck Transportation on Fruit Grades and Standards, by F. P. Weaver (pp. 410–418); The Possibilities of Reporting Shipments by Truck, by F. V. Waugh (pp. 419–424); Divergent Objectives in Cooperative Purchasing in the United States, by E. A. Perregaux (pp. 427–436); Experience of the Eastern States Farmers Exchange, by Q. Reynolds (pp. 437–440); Cooperative Purchasing in Indiana, by M. J. Briggs (pp. 441–445); Correlation of Buying and Selling in the Same Agency, by J. C. Crissey (pp. 445–447); Objectives in Production, Socially Considered, by J. D. Black (pp. 457–460); Some Limitations to the Control of Agricultural Production in the United States, by L. H. Bean (pp. 461–465); Nature of Production Control Plans, by M. Ezekiel (pp. 465–469); Types of Production Control in Foreign Countries, by L. R. Edminster (pp. 469–480); The Outlook Method of Production Control, by V. B. Hart (pp. 480–483); The Development, Achievements, and Prospects for the Outlook Method of Production Control, by C. L. Holmes (pp. 484–488); Public Participation in Planning of Adjustments, by W. E. Grimes (pp. 488–490) and by J. D. Black (pp. 490, 491); Forms of Production Control in Other Industries, by C. R. Noyes (pp. 493–500); What Social Control May These Forms of Production Control Require? by J. M. Cassels (pp. 500–503); Legal Status of Plans for Production Control, by L. S. Hul-

bert (pp. 504–515); Basic-rating and Surplus-price Plans of Fluid Milk Cooperatives, by F. F. Lininger (pp. 515–520); The Effect of Basic-rating and Other Surplus-price Plans on Dairy Farm Management, by F. H. Branch (pp. 521–524); Possible Application of Basic-rating Plan by Cooperatives to Other Commodities, by I. G. Davis (pp. 524–526); Some Production Control Attempts, by H. Metzger (pp. 526–531); Collaboration Between Public Agencies and Cooperatives in Control of Production, by J. D. Black (pp. 531, 532); The Domestic Allotment Plan, by H. I. Harriman (pp. 533–543); Possibilities and Problems Connected with Application of Allotment Plans to Wheat, by W. E. Grimes (pp. 543–545); Possibilities and Problems Connected with Application of Allotment Plans to Cotton, by C. F. Sarle (pp. 546, 547); The Voluntary Domestic Allotment Plan as Applied to Hogs, by W. R. Ronald (pp. 548–551); and Compulsory Pooling in Relation to Production Control, by A. W. McKay (pp. 551–559). An informal discussion on some of the papers is included.

The reports of the round table on production control and of the round table committees on marketing local vegetables and small fruits, fruit marketing, place and content of teaching cooperation in the public schools, membership problems, and cooperative purchasing are also included.

RURAL SOCIOLOGY

Research barriers in the South, W. Gee (*New York and London: Century Co., 1932, pp. IX+192*).—This important study was made by the author for the southern regional committee of the Social Science Research Council in cooperation with the Carnegie Foundation, which granted $5,000 for the preparation and publication of the investigation as well as for the exploitation of the findings. Chapter 2, An Historical Perspective, was prepared by L. L. Bernard. The survey was made primarily of the factors affecting social science research in the South, but in addition important data are presented concerning the natural sciences.

It is stated that for a half century subsequent to the Revolutionary War the South led the United States in scholarly productivity in political science and political economy. History was emphasized, and anthropology and sociology experienced their earliest and most assiduous cultivation. This southern interest in the social sciences received a severe backset following the Civil War, due largely to impoverished resources and diminished opportunities in southern universities and colleges.

The survey indicates that the South is being drained qualitatively, though not quantitatively, of its research talent by other sections. An analysis of data concerning southern-born social scientists in Who's Who in America, 1930–1931, indicates a "drag" of 45 per cent of these out of the South to other parts of the country. Compensating in part for the loss of 89 such individuals, 58 northern- and western-born social scientists in Who's Who migrated into southern territory, but this quantitative replacement, man for man, however, is not deemed commensurate with the qualitative loss sustained.

With regard to the natural scientists listed in the American Men of Science, 660, or 60 per cent, of the southern-born migrated from this region, but there was a return movement of 770 northern- and western-born scientists into the South. However, of the men starred in American Men of Science for outstanding contributions in their respective fields, the South lost 71, or 81 per cent of its total, and gained only 33 northern- and western-born starred scientists.

To reverse this flow of talent, the author makes two suggestions, which are supported by data gathered. First, high-grade graduate facilities must become more prevalent in strategic points in the South. Second, a larger number of

first-class opportunities for superior talent must be provided in the South. In this connection, it is shown that the salaries paid for instruction by ranks in the South average around one-third less than salaries paid for similar services in other parts of the Nation, although the cost of living does not differ materially from that of other sections of the country. The teaching load of the southern professor is approximately 30 per cent more than his northern or western colleague, and approximately 61 per cent of the southern social science professors taught for an average period of almost 8 weeks in addition to the regular 9-months term. The survey indicates that funds for research in the social sciences in the South are also largely inadequate.

Methods of social study, S. and B. WEBB (*London and New York: Longmans, Green & Co., 1932, pp. VII+263*).—Methods employed by the authors in Great Britain are presented. In the first and last chapters, the scope and limitations of the science of society are defined. Some examples of applied sociology are cited.

[Sixth and seventh annual reports of the Social Science Research Council] (*Social Sci. Res. Council Ann. Rpts., 6 (1929–30), pp. 66; 7 (1930–31), pp. 76*).—A continuation of the series previously noted (E. S. R., 63, p. 285), including data as to the progress of the committee on social and economic research in agriculture.

[Investigations in rural sociology at the Michigan Station, 1930–1932] (*Michigan Sta. Bien. Rpt. 1931–32, pp. 47–53*).—Findings are discussed as to changes in the population of Michigan during the decade 1920–1930; socializing influence of organizations and institutions in relation to rural life; the standard of living of farm families in relation to types of farming, farm practices, farm income, and community advantages; and case studies of rural communities.

Relation of variations in the human factor to financial returns in farming, W. W. WILCOX, A. BOSS, and G. A. POND (*Minnesota Sta. Bul. 288 (1932), pp. 65, figs. 2*).—This study represents a relatively new approach to the analysis of factors influencing farm income. An effort is made to evaluate the effect of the farmer's personal characteristics on farm returns on the basis of data obtained from 72 cooperators in a farm management service project. The study, being experimental and methodological in nature, is concerned with exploring all approaches to the problem that seem promising rather than with an effort to arrive at broad generalizations from the results. For this reason, the methods employed are emphasized, as well as the results themselves.

Of the reasons given by farmers for their success, farm experience ranked first, cooperation of their wives second, and ambition to succeed third. Such factors as health, fortuitous events, interest of the children, social obligations of the operator, sales resistance, and emotional drive may also at a given time be the important limiting factor. The data gathered seem to point to variations in three stimulating influences or factors of motivation, interest, need, and ambition or will, and one of the ability (judgment) that are directly reflected in the earnings or business success of the farmer.

Data indicated that men who inherited half or more of their property are not making as high current earnings as those who had to work for their entire capital, which indicates a variation in need either at present or some time in the past. Those who looked forward to or inherited property did not feel as much need for further economic accumulations as did those not inheriting any property. Men farming the same farm their fathers did, although not necessarily inheriting any of it, were not making quite as high operator's labor earnings as the men not so situated. No better results were obtained by families that had grown sons to help them than families not so situated. Older men who had grown families and an accumulation of property did not make as high earnings on the average as did the younger men. The group that had the

greatest need had the highest earnings. It did not necessarily follow, however, that the largest families living under the poorest conditions were making the highest earnings. Other controlling factors were lack of ambition for a higher standard of living and lack of ability. Ambition and interest were closely related. Good judgment and wise decisions were the foundations of managerial success.

Factors, other than those that have been inherited, that influence judgment are pointed out. Judgment-forming ability is influenced by experience, training in school and at home, health throughout life, interest, need, and ambition.

The conclusion was reached that there is no satisfactory substitute for intelligence, interest, and ambition in the farm operator. The farm families with more hired help were getting higher financial earnings than families using only family labor. Somewhat greater financial earnings are deemed within the reach of most men, and those who seriously want to better their condition are believed to have no reason for feeling that they have an insurmountable handicap in the way of lack of family help, lack of capital, lack of schooling, or any other discouraging situation.

The task of evaluating the human factor in farming was found to be a very difficult one. The approach is psychological, and the methodology to be employed must be further developed.

A study of the human factor in farm management, G. A. Pond and W. W. Wilcox (*Jour. Farm Econ., 14 (1932), No. 3, pp. 470–479*).—This is a contribution from the Minnesota Experiment Station. It describes the procedure and gives some of the results of a study organized jointly in 1930 by the division of agricultural economics of the University of Minnesota and the Bureau of Agricultural Economics, U. S. D. A., "to develop a methodology for studying the human element in farm management and to determine whether worthwhile results could be obtained along this line." The findings showed wife's cooperation, ambition to succeed, liking for farm work, age of operator, general intelligence and technical information, and rate of children's progress in school to be factors affecting the farmer's earnings. Height and weight of farmers, length of working day, and schooling of operator showed little or no effect. As to children's help, the study indicated, if anything, a negative relation between family labor and earnings. No significant difference was found in earnings of men reading only one farm paper and those reading several papers. The effect of experience could not be determined, as practically all the farmers included had adequate experience in terms of years.

The family in the present social order, R. Lindquist (*Chapel Hill: Univ. N. C. Press, 1931, pp. XIII+241, figs. 2*).—The American Home Economics Association cooperated in this study. The author recognized different types of families, but selected families of able, thoughtful men and women who have surmounted difficulties and who desire completely functioning homes. The 306 "most successful" families studied were selected in part from members of Omicron Nu and Phi Upsilon Omicron and in part from their acquaintances, and all had one or more children. The annual incomes of 92.6 per cent of families studied varied from $1,800 to $10,000 and over. Eighty-three per cent were college graduates, 17 per cent had less than a college degree, and 10 per cent of the whole number had degrees of master of arts, master of science, or doctor of philosophy.

The families were studied as to sources of fatigue, worry, and friction; factors affecting achievement in family life; economic needs of families; educational needs for marriage and parenthood, and trends; the community in relation to successful family life; and promotion of healthful and satisfying family life. A discussion of research in the field of marriage and the family is included.

Appendix 1 presents a comparison of three subgroups in the study, on the basis of the type of educational training of the women. Appendix 2 is a questionnaire for the study of home management in its relation to child development. The several chapters of the text are supported by selected bibliographical references.

The President's Conference on Home Building and Home Ownership.—VII, Farm and village housing, A. R. MANN ET AL. (*Washington, 1932, pp. XVIII+293, pls. 6, figs.* [27])—This is the seventh of a series of publications of the President's Conference on Home Building and Home Ownership. Farm and village housing is viewed as of current importance because "the farm has been the recruiting ground for the cities since the early days of America." The effort is to make rural dwellings comfortable and attractive. Farm and village housing conditions in the United States are summarized. The various aspects of building, including standards, designs, construction, cost, financing, and public interest and responsibility in housing are developed through 22 chapters and 3 appendixes. The book covers a much-neglected field.

The country church in North Carolina, J. M. ORMOND (*Durham: Duke Univ. Press, 1931, pp. XV+369, figs. 100*).—This study is exploratory, and the author does not assume that it is final. It may assist in adjusting the church to the particular social and religious needs of country people.

The book is divided into three parts. Part 1 includes general data on North Carolina, including physical and economic conditions and educational and religious backgrounds. Part 2 deals with the counties and their country churches individually. Part 3 is a general interpretation of the data presented. The conclusion is reached that the number of country churches is excessive, their physical equipment is antiquated, they are inadequately supported financially, and owing to improvements in transportation they need consolidation and relocation.

An appendix carries statistical tables of county data.

The libraries of South Carolina, M. E. FRAYSER (*South Carolina Sta. Rpt. 1932, pp. 79, 80*).—A brief summary is given of the results of a survey of the library service to rural and urban residents of the State.

FOODS—HUMAN NUTRITION

[Food studies at the Wyoming Station] (*Wyoming Sta. Rpt. 1932, pp. 20, 24–26*).—Progress reports (E. S. R., 67, p. 85) are given on studies on the cooking qualities of potatoes as related to starch content, variety, storage, and method of cultivation and on the effect of storage on the vitamin C content of Bliss Triumph potatoes and of storage on the baking qualities of Wyoming flours.

Chemical composition and culinary quality of potatoes (*Michigan Sta. Bien. Rpt. 1931–32, p. 21*).—A progress report on factors influencing the culinary quality of potatoes with special reference to blackening on cooking.

Winter storage of vegetables for family use (*Montana Sta. Rpt. 1931, p. 57*).—This is a brief progress report on a study of the effect of different methods of home storage on the nutritive value, vitamin potency, and appearance of various winter vegetables.

How to make honey-cream, P. H. TRACY (*Illinois Sta. Bul. 387 (1932), pp. 545–556,* figs. *3*).—The preparation of honey-cream, a combination of high-test sweet cream and strained honey, for use as a spread on bread, biscuits, and the like, is described in this bulletin.

The cream used should test from 75 to 80 per cent butterfat and should be obtained from milk of high quality, free from metal contamination. The milk

is heated to from 142 to 145° F. for 30 minutes and separated at that temperature, using tinware made especially for the purpose with centrifugal separators. The milder flavored honeys, such as sweetclover, alfalfa, etc., proved to be the most suitable of 13 honeys tested for combining with the cream. Additional flavor combinations could be made by using maple, coffee, chocolate, orange, sorghum, and raspberry, but when used the amounts of honey had to be reduced.

The honey is momentarily heated to at least 155° and mixed with the cream, while warm, in the ratio of 42 parts of honey to 58 parts of cream. The mixture is then packaged and cooled to 40° or lower. Honey-cream must be refrigerated to prevent the fat from separating and to retard the development of a tallowy flavor. Rancid flavor sometimes resulted from the use of raw cream or unheated honey. Keeping honey-cream longer than 2 weeks at 40° is not advised. In the proportions recommended and using 75 per cent cream, the fat content of honey-cream is approximately 43.5 per cent and the total solids content 80 per cent.

Nutrition and physical fitness, L. J. Bogert (*Philadelphia and London: W. B. Saunder Co., 1931, pp. 554, figs. 65; rev. in Jour. Home Econ., 24 (1932), No. 1, pp. 59, 60*).—As stated in the preface, this volume has been written with a threefold purpose: "(1) To gather into a single volume facts useful in meeting every-day nutritional problems, which have been gleaned from the fields of food composition and economics, the chemistry and physiology of body processes, dietetics, and medicine. (2) To make this information available to a comparatively large group by presenting it in such simple language as to be understandable to those with no previous knowledge of chemistry. (3) To point out, in every instance possible, how such knowledge may be utilized for preventing ill health and promoting a high degree of physical fitness."

The subject matter is presented in five parts, dealing, respectively, with foods, body needs, body processes, meal planning, and diet for special conditions.

Standards for predicting basal metabolism.—I, Standards for girls from 17 to 21, M. E. Stark (*Wis. Acad. Sci., Arts, and Letters, Trans., 27 (1932), pp. 251–320, figs. 4*).—This contribution from the department of medicine and the Wisconsin General Hospital, University of Wisconsin, reports basal metabolic rates determined in 163 tests on 97 girls of ages quite uniformly divided between 17, 18, 19, and 20 years. The subjects were university students who were classed as grade A in their medical and physical examinations and were free from any defects which might disqualify them as physiological normals. The tests, with one or two exceptions, were all made with the Benedict portable form of the closed-circuit type of apparatus with motor-driven circulation. All tests were accepted for analysis except in cases of technical flaw, lack of cooperation, or unfavorable state of health of the subject at the time of the test. The results were subjected to various comparative analyses and the first accepted tests on the 97 subjects were made the basis of a prediction standard according to the following equation, derived from standard methods of multiple correlations:

$$h=10.63w+3.23s+184.61,$$

where h=heat production in calories per 24 hours, w=body weight in kilograms, and s=standing height in centimeters.

This standard was used to calculate the metabolic rates of the individuals in the original series, both first and later tests, and similar calculations were made in terms of the Aub-DuBois standard, the Harris-Benedict prediction for adult women extrapolated for these ages, and the Benedict special prediction for girls from 12 to 20 years. The same calculations were carried out on

basal metabolic data for presumably normal girls of the same age from Wisconsin other than the standard series and similar data reported by Tilt from Florida (E. S. R., 63, p. 593), Remington and Culp from South Carolina (E. S. R., 66, p. 489), and Benedict (E. S. R., 60, p. 389). Distribution charts were also made of the metabolic rates in the same series. Finally, older predictions were centered by applying the constant percentage correction to each which would make their zero points correspond practically to that of the Wisconsin studies. Various criteria of suitability, such as average rates, standard error of predicting the rates, percentiles within plus or minus 15 per cent of the average expectation, and extreme ranges of rates by the different predictions, were then applied to determine which of the standards, with predictions in the same range, would prove the most satisfactory.

"By all the above criteria the Wisconsin standard proved to furnish a somewhat better fit for both Wisconsin and other normals than did either of the two most satisfactory of the older standards, that of Harris and Benedict, or that of Aub and DuBois, even after centering to make their zero points coincide. However, of the two latter the Harris-Benedict, when extrapolated for the ages in question and lowered by 7 per cent, showed itself nearly as satisfactory in the various respects as did the Wisconsin standard, which was established by similar methods of analysis for a comparatively large number of subjects within a narrow range of ages."

It is concluded that the "Wisconsin prediction may safely be used as a standard of reference for similar classes of girls who are studied with comparable technic anywhere in America."

Respiratory quotient in obese subjects, D. M. Lyon, D. M. Dunlop, and C. P. Stewart (*Biochem. Jour., 26 (1932), No. 4, pp. 1107–1117*).—In a series of 34 observations on the respiratory quotient of obese subjects on a subcaloric diet of 2,000 calories or more, loss in weight occurred and the average respiratory quotient was 0.755, with values below 0.7 for 3 of the subjects. On diets furnishing from 1,000 to 1,200 calories, the average respiratory quotient in 117 observations was 0.721, with values below 0.7 in 51 instances. When the carbohydrate content of the low calorie diets was reduced without lowering the calorie content, the average respiratory quotient fell to 0.678, with values below 0.7 in 12 out of 15 cases. The administration of thyroid extract to subjects on the low calorie diet produced slight increases in the respiratory quotient, the values averaging 0.727 in 70 determinations, with only 14 below 0.7. Ketonuria was usually absent when the observations were made, and when present was only slight.

These results are discussed, with the tentative conclusion that in the undernourished obese subject fat is converted into carbohydrate.

The value of vegetarian diets for maintenance, S. Wan and H. Wu (*Chinese Jour. Physiol., 6 (1932), No. 3, pp. 251–255, fig. 1*).—The term maintenance is used in this paper to signify the nutrition of nonbreeding adult animals. A comparison of the composite weight curves of well-matched male and female rats on the omnivorous and vegetarian diets previously used in growth studies (E. S. R., 65, p. 692) starting at the age of four months showed somewhat higher values for the animals on the omnivorous than on the vegetarian diets.

Laxative effects of wheat bran and "washed bran" in healthy men: A comparative study, G. R. Cowgill and W. E. Anderson (*Jour. Amer. Med. Assoc., 98 (1932), No. 22, pp. 1866–1875, fig. 1*).—The general plan of this investigation, which was undertaken to answer the disputed question as to whether the well-known laxative effect of bran is due simply to its high fiber content or to the presence of phytin, consisted in having healthy men subsist first on a carefully selected basal ration, the laxative effects of which had been deter-

mined in a preliminary period of observation, and then on the same ration supplemented by selected amounts of whole or washed bran equivalent in their fiber content. The criteria of laxative action observed were "(1) subjective impressions of the persons concerning the complete and satisfactory character of elimination; (2) the amount of intestinal contents evacuated under the test conditions; (3) the water content of the stools, a large amount of water being indicative of only a brief stay of fecal material in the colon with consequent failure of absorption of water, and a low water content pointing to the opposite condition; (4) the time of passage of material through the alimentary tract; (5) the number of defecations in a unit of time, or laxation rate, and (6) the amount of indigestible substance, fiber, for example, present in the stool and the relation of this to the quantity ingested." Observations made throughout the investigation have led to the conclusion that the rate of laxation, although not the most sensitive criterion of laxative effects, is, nevertheless, the most valuable.

After preliminary trials, three diets were selected, one being considered satisfactory from the point of view of laxation, another mildly constipating, and a third markedly constipating. These diets, which are itemized in the amounts of the various constituents consumed daily, furnished 6.3, 5.25, and 3.1 g of fiber per man per day, respectively.

The investigation consisted of three parts. In the first or preliminary period in which 5 men served as subjects, whole bran and two bran products were used as supplements to the first diet in experimental periods of 4 days. Although there were no subjective differences noted between the effects of the supplemented and unsupplemented diets, there was an increased elimination of fecal material in 13 out of 15 instances on the supplemented diet.

In the second part the mildly constipating diet was used, supplemented as before with whole and washed bran. Five men served as subjects, and the experimental period was of 14 days' duration for 4 and 10 days' for the fifth. On this diet the laxative action of the bran was evident as determined both by subjective impressions and by an increased amount of material eliminated, but negative with respect to laxation rate.

On the third or markedly constipating diet, which was used with 4 subjects, definite laxative effects of both forms of bran were apparent as judged by all criteria, with the possible exception of the water content of the stools, a criterion considered of little value.

In all three series of experiments there were no appreciable differences between whole bran and washed bran, leading the authors to conclude that "the statement often made in the literature that 'the laxative value of bran is due largely to the phytin which it contains' is erroneous. In making bran products for human consumption the indications of this research are that the laxative value of such materials may be estimated fairly accurately from the fiber content."

Observations are also reported on the alimentary disappearance of fiber, the modification of the demonstrable laxative effect of bran by amounts of fiber already present in the diet, and on a comparison in one of the subjects of the amount of ingested fiber and rate of laxation on a large number of diets of varying fiber content. As a result of the entire series of observations, the authors draw the following significant conclusions:

"The data obtained in this research support the view that in healthy men a definite relationship exists between the rate of laxation and the amount of fiber ingested daily per unit of body weight. This points to the existence of a physiologic roughage minimum, which, in terms of fiber, is obtained with an intake of from 90 to 100 mg of fiber per kilogram of body weight daily. Such an intake of fiber by healthy men should contribute definitely toward securing

satisfactory laxation. A somewhat greater fiber intake may be required to secure the physiologic fiber optimum."

Lactose in nutrition, O. L. KLINE, J. A. KEENAN, C. A. ELVEHJEM, and E. B. HART (*Jour. Biol. Chem., 98 (1932), No. 1, pp. 121–131, fig. 1*).—In this investigation of the effect of lactose feeding on calcium retention and utilization, chicks were used as experimental animals because of their sensitivity to rickets and because their intestinal tracts are large enough to furnish sufficient material for accurate pH measurements.

On a rachitic ration consisting of yellow corn 58, standard wheat middlings 25, crude casein 12, sodium chloride 1, yeast (dry Northwestern) 2, and calcium carbonate 2 parts, day-old chicks developed definite symptoms of rickets in 5 to 6 weeks, at which time the ash content of the alcohol-extracted bones was from 26 to 28 per cent. When the ration was supplemented with irradiation of the chicks, normal growth followed and the bone ash was about 40 per cent. In preliminary trials when lactose was added to the basal ration at 2, 5, 10, and 20 per cent levels, replacing in each case an equivalent amount of yellow corn, the chicks in all groups except the basal with irradiation developed rickets, although with slight delay in the 10 and 20 per cent lactose groups. The bone ash showed progressive increases in the lactose groups over the basal, but was not quite as high on the 20 per cent lactose diet as on the basal supplemented with irradiation.

The level of lactose feeding in other groups was gradually increased to 40 per cent, with necessary adjustments in the protein and vitamin A to offset the loss from decreases in the yellow corn. At the 40 per cent level lactose was found to have a very favorable effect upon calcium absorption and skeleton building, the bone ash values averaging 39 per cent as compared with 40.4 per cent in the group receiving sufficient vitamin D. In all cases of lactose feeding growth was subnormal in the absence of vitamin D. This is attributed to the increased water consumption and catharsis caused by the high level of lactose in the ration. The ash content of the bones of irradiated chicks receiving lactose was distinctly higher than of the irradiated chicks receiving the basal ration alone. This is thought to indicate that lactose acts as a supplement to vitamin D in calcium assimilation. Maltose and citric acid were without effect.

In an attempt to explain the action of lactose, pH determinations with the quinhydrone electrode were made of five segments of the intestinal tract (minus the large intestine) immediately after killing the chicks. The pH curves showed a distinct increase in acidity in the upper part of the intestines of the birds receiving ultra-violet irradiation in addition to the rachitic ration, while the addition of lactose alone or with vitamin D increased the acidity throughout the entire tract.

The authors suggest that the favorable effect of human milk in the prevention of rickets may be due partly to its high content of lactose, 55 per cent of the total solids.

Growth and reproduction of rats on an improved stock diet, H. WU, S. WAN, and T. T. CHEN (*Chinese Jour. Physiol., 6 (1932), No. 3, pp. 295–306, figs. 3*).—This is a further discussion of the merits of a new stock diet for rats described by Wan and Lee (E. S. R., 66, p. 289). Growth curves of rats on the new diet are better than the average reported by Smith and Bing (E. S. R., 61, p. 694), and the reproduction and lactation records are considerably better than those on the best diets now in use.

Hemoglobin-building properties of soy bean products, W. H. ADOLPH and H. C. KAO (*Chinese Jour. Physiol., 6 (1932), No. 3, pp. 257–263, fig. 1*).—Soybean meal, soybean cheese, and soybean milk were tested for their hemoglobin-building properties by feeding ad libitum to young rats rendered anemic on

a sole diet of milk. The iron content of the various soybean products was determined by the method of Elvehjem (E. S. R., 64, p. 712) and the copper content by the Biazzo method as perfected by Elvehjem and Lindow (E. S. R., 61, p. 612), and the daily intake of these elements was calculated from the food consumption records.

The recovery on the soybean meal furnishing an average of 1.29 mg of iron and 0.65 mg of copper per rat per day was as rapid as on the milk-liver-iron control ration. The recoveries on the soybean cheese and soybean milk were more gradual. The average iron and copper intake were 0.78 and 0.12 mg per rat per day, respectively, for the soybean cheese and 0.97 and 0.61 mg, respectively, for the soybean milk.

It is considered of especial interest that soybean milk, which in recent years has been much exploited as an infant food in China, is so superior to cow's milk in its hemoglobin regenerating properties.

The estrual cycle in rats on a manganese-free diet, E. R. Orent and E. V. McCollum (*Jour. Biol. Chem., 98 (1932), No. 1, pp. 101, 102*).—The authors report that in confirmation of earlier studies,[2] but contrary to the preliminary findings of Waddell et al. (E. S. R., 66, p. 89), reproduction of rats is normal on a manganese-free diet supposedly essential in other respects. The rats on the manganese-free diet and those on the diet supplemented with manganese grew normally, while the growth on milk diets was below normal.

Some considerations on the influence of copper and manganese on the therapeutic activity of iron, J. H. Sheldon (*Brit. Med. Jour., No. 3749 (1932), pp. 869–872*).—This critical review and discussion of the literature on the relation of copper to iron in the prevention and cure of nutritional anemia and the distribution and function of manganese in the body is supplemented with hitherto unpublished data obtained by the author in conjunction with H. Ramage and W. Sheldon on the copper, iron, and manganese content of human livers. The new data show that with the possible exception of zinc, which could not be determined by the spectrographic method employed, copper and iron are the only metals stored as reserve material in the liver during fetal life. The values for both rise steadily until birth, when figures as high as 0.06 per cent for copper and 0.4 per cent for iron of the dry weight of the organ are obtained. After birth these values drop steadily, until at the age of from 12 to 18 months they are only about one-tenth the birth values and fluctuate only slightly from these values through life. Since the reserve store of these elements is acquired from the mother, the possibility is suggested of lessening the incidence of anemia in infants by providing more ample supplies of these elements in the diet during pregnancy.

The explanation advanced by Josephs (E. S. R., 68, p. 128) of the mechanism of the action of copper on the utilization of iron for hemoglobin formation and regeneration is reviewed in considerable detail. As a practical application of this theory the advisability is suggested of giving larger doses of iron in connection with copper than would otherwise be given in order to insure an adequate supply of iron for the two purposes of growth and hemoglobin formation. Copper is considered to play an important part in growth in the sense of causing a stimulation of the demand for iron. It is pointed out that while little is known concerning the relative dosage of the two metals which will give the best results, some of the reported failures of clinicians to obtain results with copper may have been due to inadequate doses of iron.

Attention is called to isolated observations in the literature that the copper content of the blood in nutritional anemia is sometimes higher than during convalescence. "It is hard to say what these findings may mean, and in any

[2] Jour. Biol. Chem., 92 (1931), No. 3, pp. 651–678,, fig. 1.

case they need confirmation on an extended scale. It may be that all the available reserves of copper are being mobilized to cope with the demand for new hemoglobin or that the figure is high because the copper, though mobilized, can not be utilized by the body owing to the absence of a further factor, such as some vitamin lack. The observation serves at any rate to show how wide are the gaps in our knowledge of the physiological action of copper."

In regard to manganese, the absence of reserve stores of this element in the fetus is thought to provide evidence that it is not concerned in the formation of hemoglobin. It is considered, however, that it is probably essential to the proper functioning of the endocrine organs, particularly those concerned with reproduction.

Evidence of the existence of a dietary principle stimulating general growth and lactation, L. W. MAPSON (*Biochem. Jour., 26 (1932), No. 4, pp. 970–986, figs. 11*).—An investigation of the effect upon growing rats of supplementing with liver a diet containing all known essentials in supposedly adequate amounts is reported, with the conclusion that liver contains an unidentified substance capable of intensifying growth rate to a supernormal degree. Inasmuch as the animals showing the increased growth rate do not lose in weight after the withdrawal of the liver, it is concluded that normal physiological processes are involved. The suggestion is made that the stimulation may be one of endocrine function, and the tentative name of "physin" is given to the unidentified substance responsible for this stimulation.

The experimental work reported furnishes evidence that the stimulating effect of fresh liver on growth rate is more marked in the male than in the female, that a stimulating effect on growth rate after weaning can be transmitted from parents to offspring fed solely on the synthetic diet, that the average number born to parents fed liver is definitely larger than the average number in control litters, and that it is not necessary to feed the liver over a prolonged period before breeding. It has also been demonstrated that liver has a stimulating effect on lactation, but whether the substances stimulating growth and lactation are identical or not has not yet been determined.

Evidence is also presented ruling out as identical with the new growth principle the factor described by Coward et al. (E. S. R., 62, p. 589), vitamins A and D, the various factors in the vitamin B complex, protein, and inorganic salts.

Attempts to concentrate the factor from aqueous liver extracts led to the discovery that autolysis of the liver prior to extraction results in a larger yield of active material. In explanation of this it is suggested that the active principle may be an integral part of a large molecule liberated through enzymic action, or that it occurs intracellularly in the tissue and is removed more easily after destruction of the cell membrane. The substance can be extracted from either fresh or autolyzed liver by 90 per cent alcohol, the activity remaining in the alcohol-soluble fraction.

Vitamin studies, III, IV [trans. title], F. V. v. HAHN (*Ztschr. Untersuch. Lebensmtl., 61 (1931), Nos. 4, pp. 369–411, figs. 30; 6, pp. 545–611, figs. 50*).—In the first of the two papers noted below, the author presents his reasons for choosing vitamin C as the most important vitamin to be considered in food selection in Germany, and discusses the differences between his methods and those of Scheunert (E. S. R., 62, p. 395) in determining the vitamin C content of fruits and vegetables. In the experiments upon which the values reported are based, at least 12 animals were used for each of the foods tested, each animal was given the test substance at one concentration only throughout the entire experimental period, and the basal diet consisted only of oats and hay of tested freedom from vitamin C. On the theory that the requirement

for man is about 50 times that of the guinea pig, the test substances were never fed in amounts over 10 g daily. The foods were normal market products and not specially selected for high quality. In both papers the results are given for both growth and protection from scurvy, and it is shown repeatedly that these two do not always run parallel and that the antiscorbutic value should be based upon the degree of protection from scurvy rather than upon growth.

To express antiscorbutic values numerically, the term guinea pig unit has been adopted. This unit is calculated by dividing 100 g by the smallest daily dosage in grams affording complete protection to guinea pigs against scurvy. The requirement for man is considered to be 50 guinea pig units. In appraising the food materials tested for their practical value as sources of vitamin C in the diet, the number of guinea pig units in the weight of a customary serving of the food is calculated. Servings furnishing more than 120 guinea pig units are classified as extremely rich, 120 to 50 as rich, 50 to 30 as containing the vitamin, 30 to 12 as vitamin poor, and under 12 practically vitamin free.

III. *The vitamin content of fruits* [trans. title] (pp. 369–411).—In most instances the fruits were tested raw and prepared by passing through a sieve and in some instances diluting with an equal volume of water. Such fruits as apples, pears, etc., were pared. The fruits tested, in decreasing order of their vitamin C potency in guinea pig units (in the fresh raw state unless otherwise noted), were black currants and orange juice 200 units; strawberries and dried, cooked rose hips 100; raspberries, gooseberries, and mandarins 50; black and red cherries and dried black currants less than 50; red currants 33; peaches, bananas, pineapples, and dried currants 16; pears, greengage plums, dried fig bananas, figs, and dates less than 16; fall apples 12; cooked elderberries, three varieties of apples, and two of plums 10; and blueberries, raw and cooked mountain cranberries, elderberries, Gravenstein and Jonathan apples, raw and cooked quince, grapes, and dried bananas less than 10 units.

In calculating the practical value of these fruits as sources of vitamin C in the diet, servings of 125 g were used for most fruits, 100 for pineapples, peaches, and bananas, 60 for oranges and mandarins, and 50 for dried fruits. In terms of these servings, strawberries, oranges, and lemons are classified as extremely rich in vitamin C; gooseberries, raspberries, and raw and cooked rose hips as rich; red raspberries and mandarins as vitamin-containing; and the other fruits as low in or practically free from vitamin C.

IV. *The vitamin content of vegetables from the German retail market* [trans. title] (pp. 545–611).—All of the vegetables were tested in the raw state, edible portion, and such as are ordinarily eaten cooked were also tested after cooking for varying lengths of time, depending upon the vegetable. In some cases the cooked vegetables were drained before being used and in others cooked with only a small amount of water and the water retained.

In decreasing order of potency expressed in guinea pig units, as noted above, the vegetables tested (raw unless otherwise stated) were as follows: Kohlrabi more than 200 guinea pig units; parsley and horseradish 200; green cabbage 150; red cabbage, cauliflower, brussels sprouts (raw and cooked), and chives 100; the juice of white cabbage 80; small radishes and cooked horseradish 50; corn salad 40; rutabaga, green cabbage (cooked), kohlrabi (cooked), peas, and pea pods 33; lettuce less than 33; asparagus and green leeks 25; green beans, asparagus (cooked), white leeks, endive, radishes, and tomato (raw and cooked) 20; rutabaga (cooked), new and old carrots (raw and cooked), new sauerkraut (raw and cooked), white and green leeks (cooked), red beets (raw and cooked), celeriac (cooked), and onions less than 20; red cabbage (cooked), spinach, green peas (cooked), and cauliflower (cooked) 16; wax beans 15 and wax beans (cooked) 13; cucumber 12; pumpkin 10; old sauerkraut (raw and

cooked), spinach (cooked), mushrooms (raw and cooked), pumpkin (cooked), and cucumber (cooked) less than 10; and green beans (cooked) 8 units.

In appraising these vegetables as practical sources of vitamin C in the diet, servings of 300 g were used in general, with 100 g for lettuce, raw cucumbers, raw pumpkin, and radishes, 50 g for horseradish, 20 for small radishes, and 10 g for parsley, chives, and onions. Vegetables classified as extremely rich in vitamin C were raw white, red, and green cabbage, kohlrabi, and cauliflower, and raw and cooked brussels sprouts; as rich in vitamin C raw rutabaga, cooked green and red cabbage and kohlrabi, raw peas, asparagus, leeks, horseradish, and green beans; and as vitamin-containing raw carrots, new sauerkraut, spinach, and head lettuce, cooked rutabaga and peas, and raw and cooked wax beans. The others were classified as low in vitamin C or almost lacking in this vitamin.

[Vitamin studies at the Washington Station], M. T. Potter (*Washington Col. Sta. Bul. 275 (1932), pp. 38, 39*).—Studies are summarized on the vitamin C content of Washington-grown Winesap apples, including samples from fertilized and nonfertilized trees; the relative vitamin A content of the yellow-tissued Golden Delicious and Starking and the white-tissued McIntosh apples; and of the vitamin A content of six varieties of frozen cherries, including sweet, sour, and hybrid types.

[Vitamin studies at the West Virginia Station] (*West Virginia Sta. Bul. 254 (1932), p. 43*).—A brief progress report is given on studies dealing with the protective function of vitamin A in infection and the histology of bone growth in vitamin D deficiency.

The significance of vitamins on the course of infections [trans. title], H. C. A. Lassen (*Ztschr. Immunitätsf. u. Expt. Ther., 73 (1932), No. 3–4, pp. 221–239*).—In this complete report of an investigation noted previously from a preliminary report (E. S. R., 64, p. 589), evidence is presented showing that a deficiency in vitamin A in rats leads to a greatly lowered resistance to paratyphoid infection induced orally, intravenously, or subcutaneously. A deficiency of the vitamin B complex or partial inanition led to a very slight lowering of resistance and a deficiency of vitamin D to no lowering of the resistance of the same organisms similarly introduced.

The determination of the vitamin A content of human blood serum [trans. title], J. G. Menken (*Deut. Med. Wchnschr., 58 (1932), No. 38, p. 1484*).—The method followed consisted in separating the serum from 20 c c of blood by centrifuging, adding 10 volumes of 96 per cent alcohol, centrifuging, and shaking out the alcohol with petroleum ether. The petroleum ether extract, which was colored yellow from carotene, was evaporated to 1 c c and its content of carotene determined in a Lovibond tintometer. The solution, after further concentration to 0.2 c c, was used for the antimony trichloride color test for vitamin A.

The vitamin A content of the sera varied from 0 in the case of lying-in women and newborn infants to from 1 to 13 Lovibond units in healthy subjects and 2 to 13 in patients who had been in the clinic for some time. In general the ill subjects had a lower vitamin A content in the blood serum than the healthy subjects.

The carotene content varied from 1.1 to 65 Lovibond yellow units, and as in the case of vitamin A the lowest values were found in the lying-in patients and newly born infants and lower values in ill than in healthy subjects.

A grouping of the subjects according to their economic status gave average values for vitamin A of 1.27 blue units for a group of 56 subjects of low economic status and 3.4 for 24 of a higher status, with corresponding values for carotene of 19.3 and 30γ, respectively.

The transmission of vitamin A from parents to young in mammals, W. J. Dann (*Biochem. Jour., 26 (1932), No. 4, pp. 1072–1080, fig. 1*).—This paper reports a quantitative study of the effect of the carotene content of the maternal diet before and during lactation upon the amount of vitamin A received by young rats up to the time of weaning, together with supplementary information on the content of vitamin A in the liver of the embryo rat and rabbit. The vitamin A determinations were made colorimetrically and expressed in Lovibond blue units calculated by the method of Moore (E. S. R., 64, p. 393). The livers of rat embryos at the fifteenth day of gestation contained 5 and those of the fetus at birth 10 blue units, the latter corresponding to 30 blue units per gram of liver tissue. The livers of rabbit embryos at 4 weeks contained 30 and of fetuses at birth 100 blue units, the latter corresponding to 25 blue units per gram of liver tissue.

The method followed in the investigation proper consisted in maintaining 9 female rats of the same litter from weaning to the birth of their first litters on diets of very low (2 animals, of which 1 died early in the experiment), medium (3 animals), and very high (4 animals) carotene content. During the suckling of the first litter the carotene content of the mothers' diet varied from none to very high. After weaning the young were kept on a vitamin A-free diet until their stock of vitamin A was depleted.

The amounts of vitamin A in the livers of the young at birth varied only from 0 to 10 blue units, showing that the administration of large quantities of carotene to the mother before or during pregnancy had little effect on the vitamin A content of the young at birth. At weaning the vitamin A values varied from 0 in the case of the offspring of the rat receiving almost no vitamin A to 75 blue units. The values were more variable and showed a slight but not marked effect as the result of carotene feeding to the mother. The livers of the mothers after weaning varied widely in vitamin A content, from 20 in the case of the animal on the diet low in vitamin A to from 10,000 to 22,000 blue units in the animals on high carotene.

The weights of the young at weaning, the maximum weight attained on the A-free diet after weaning, and the days required for depletion did not appear to be affected significantly by the carotene content of the mothers' diet except under conditions of almost complete deprivation of vitamin A.

On the assumption that the transmission of vitamin A from mother to young is similar in human beings, it is concluded that "the best way of applying vitamin A therapy with the object of giving the child a reserve of vitamin A is to dose it directly. Failing this, the best results may be expected to follow from giving the mother regular fairly high doses of vitamin A during the period of suckling. To give the mother vitamin A during pregnancy will not affect the vitamin store of her child to any noticeable extent."

Relation between vitamin A potency and carotene content of green plant tissue, W. C. Russell, M. W. Taylor, and D. F. Chichester (*Soc. Expt. Biol. and Med. Proc., 30 (1932), No. 3, pp. 376, 377*).—In this preliminary report from the New Jersey Experiment Stations, data are presented on the carotene content of samples of dried alfalfa producing comparable growth responses in young rats when fed as the sole source of vitamin A and on the quantity of carotene required to produce practically the same growth effect. The carotene was determined by a colorimetric method based on the original procedure of Willstätter and Stoll (E. S. R., 30, p. 311) and was administered in ethyl laurate and olive oil, with hydroquinone added as an antioxidant.

The data show that a smaller amount of carotene was required in the form of the plant tissue than as the carotene itself. "This difference might be due to a greater potency of carotene in association with plant tissue, to the presence

of some unknown substance which has growth-promoting properties in vitamin A-deficient animals, or to the conversion of part of the carotene in the plant tissue to vitamin A during the curing process." Whatever may be the explanation, it is thought that the determination of carotene, although serving as a rough indication of vitamin A potency, can not be substituted for the biological assay in such materials as used in the present study. The possibility is suggested that the drying process may have affected the relation of the carotene content to the animal response.

A comparison of apricots and their carotene equivalent as sources of vitamin A, A. F. MORGAN and E. O. MADSEN (*Jour. Nutrition, 6 (1933), No. 1, pp. 83–93, fig. 1*).—The plan of this investigation, as in the preliminary studies of Russell et al. noted above, consisted in comparing the carotene content and biological activity as sources of vitamin A of certain plant tissues and the biological activity of carotene administered in amounts equivalent to the carotene content of the plant tissue. Royal apricots were selected as the food material inasmuch as this fruit is exceptionally rich in carotenoid pigments and its vitamin A activity had been tested biologically (E. S. R., 64, p. 789). The apricots were tested fresh frozen, unsulfured sundried, and sulfured sundried. The carotene was extracted from the samples by pyridine, as suggested by Smith and Spoehr (E. S. R., 63, p. 503) and also by acetone and ether as described by Schertz (E. S. R., 62, p. 616) and determined colorimetrically in petroleum ether or ether solution. The pyridine was found to extract the dried samples more readily and completely than acetone and ether, although the nature of the additional pigment was doubtful.

As determined on the pyridine extracts, the samples of fresh frozen apricots had a maximum of 0.102 mg of carotene per gram of fruit solids as compared with 0.066 and 0.060 mg for the sulfured and unsulfured dried samples, indicating carotenoid losses on drying of 36 and 41 per cent, respectively. The quantities of the fruit calculated to the fresh equivalent required to promote growth at approximately the 3 g a week level of the Sherman standard were 15, 30, and 31 mg, respectively. Similar relationships were shown with the larger amounts fed, indicating vitamin A losses on drying of from 50 to 75 per cent. Crude crystalline carotene, m. p. 162 to 164° C., promoted growth at an average rate of 4.3 g per week when fed in ethyl laurate at a level of 0.001 mg and purified carotene, m. p. 179 to 180°, at the rate of 6.9 g per week when fed at the same level. In curative experiments this dosage was insufficient, but on 0.002 and 0.005 mg of the pure carotene all of the deficiency symptoms were cured.

When compared on the basis of equivalent carotene content, the fresh frozen apricots and the sulfured dried apricots gave as good growth as the carotene. With the unsulfured dried products growth was not proportional to the calculated carotene content. "This is in accord with our suspicion that certain colored derivatives of carotene or a similar compound present in the unsulfured samples are extracted by both methods used for carotene determination, and that our reported figures for the carotene content of these samples are consequently higher than they should be."

Although the data point to complete conversion of the carotene of apricots into vitamin A in the animal body, caution is expressed against acceptance of carotene determinations as equivalent to biological tests for vitamin A content until further experiments have been carried on with other plant products to determine completeness of carotene absorption.

The absorption of nitrogen and of fat from the alimentary canal of rats kept on a vitamin A-deficient diet, M. M. SAMPSON, M. DENNISON, and V. KORENCHEVSKY (*Biochem. Jour., 26 (1932), No. 4, pp. 1315–1321*).—In this preliminary investigation of the factors responsible for the pathological condition

leading to failure of normal growth in rats on a vitamin A-deficient diet, two suggested explanations were tested—one a decreased food intake resulting from loss of appetite and the other a decreased absorption of food from the alimentary canal.

Two pairs of rats from the same litter were maintained on a vitamin A-deficient and complete diet, the control in each pair receiving the same quantity of the complete diet as the litter mate had consumed of the vitamin A-free diet the preceding day. Comparisons were made of the body weight, appetite, intake and absorption of fat and nitrogen, and the nitrogenous metabolism of the matched pairs.

During the period of checking or cessation of growth, the decrease in food intake was not enough to offer more than a partial explanation of the change in rate of growth, and the absorption of nitrogen and of fat was not appreciably altered. In the final period, marked by decided decrease in appetite, there was a decrease in food intake and in absorption from the alimentary canal sufficient to account chiefly for the marked loss in weight. During the whole period of observation there was an increase in nitrogen excretion. "This pathological condition of metabolism may be the direct result of deficiency of vitamin A, or the indirect result of the deficiency of the endocrine organs controlling metabolism. The data at present available give no indication as to which of these factors is responsible.

"The chief factor in checking the growth seems to be that one unit of the vitamin A-deficient food consumed by the rats produces a much smaller increase in body weight than the same unit of complete diet. Perhaps this fact is correlated with the increased metabolism. If even a slight pathological condition of absorption is also present, the total effect on growth will be greater."

The influence of vitamin A deficiency on male rats in paired feeding experiments, M. M. Sampson and V. Korenchevsky (*Biochem. Jour., 26 (1932), No. 4, pp. 1322–1339*).—In this continuation of the investigation noted above, the influence of vitamin A deficiency on the body weight, fat deposition, and weight of the endocrine organs was studied on 63 male rats belonging to 12 litters. In two of the tests, in which the vitamin A deficiency was less complete, the experimental and complete control diets were given ad libitum. In the other 10 the rats were paired as in the preceding study.

It was found that in the absence of vitamin A the same quantity of food ingested produced a smaller increase in body weight and presumably in the growth of the animals. The decreased food intake appeared to produce greater changes in fat deposits than in general body weight. When the weights of the various organs were calculated in terms of the same unit of body weight, it was found that in most of the rats on the deficient diet the weights of the testes and especially of the prostate with seminal vesicles were greater than those of the paired rats on complete diet. This was attributed to edema. Other changes noted in the A-deficient animals were reduction in weight of the thymus and hypertrophy of the thyroid glands. The latter condition, however, was found to be due to iodine deficiency. No significant changes were observed in the weights of the adrenals or of the hypophysis.

Changes in the testes of rats kept on a diet deficient in vitamin A, M. M. Sampson and V. Korenchevsky (*Jour. Path. and Bact., 35 (1932), No. 6, pp. 875–887, pls. 4*).—Contrary to the conclusion of Mason (E. S. R., 64, p. 591) that the severity of the degenerative testicular changes in vitamin A deficiency is in direct proportion to the duration and severity of xerophthalmia, no invariable or strict relationship between the two could be noted. The changes could not be attributed to loss of appetite but to absence of vitamin A alone. The administration of an additional amount of vitamin E in the form of wheat germ oil did not prevent the degeneration.

The authors correct the statement made in the earlier papers noted above that the weights of the testes per unit weight of body tissue are greater in the vitamin A-deficient than in the control rats. The increase previously noted is attributed "to the predominance of testes at the initial and intermediate stages of degeneration," at which time edema was present. In the later stages the weights of the testes are smaller as the result of atrophic changes in the seminiferous tissues.

The assay of Vitamins B and G as influenced by coprophagy, N. B. GUERRANT and R. A. DUTCHER (*Jour. Biol. Chem., 98 (1932), No. 1, pp. 225–235, figs. 2*).—A quantitative study is reported of the effects of feces consumption on vitamin B and G experiments on rats. The amounts of vitamins B and G found in the feces appeared to be about equal and to be independent of the content of these factors in the diet. The data are thought to indicate quite clearly that both vitamins are synthesized in the body, but the manner of this synthesis is not understood. It is considered very essential to prevent coprophagy in the assay of foods for vitamins B and G. To do so successfully may necessitate a series of screens of different sized meshes to be changed from time to time as the animals increase in size.

Note on the international standard for the antineuritic vitamin B_1, H. CHICK and H. M. JACKSON (*Biochem. Jour., 26 (1932), No. 4, pp. 1223–1226*).—This note should be of service to those planning to use the international standard for vitamin B (B_1) now available (E. S. R., 67, p. 776). Data are reported on the vitamin B value of samples of dried yeast, wheat embryo, and Peters' antineuritic concentrate from yeast in terms of the standard. The minimum daily dose of the standard required to promote an average weekly increase of from 10 to 14 g in young rats for 5 weeks was found to be about 10 mg, and for use in the comparisons this amount was diluted tenfold with pure dextrin. From the quantities of yeast and wheat embryo required to promote the same rate of gain, the yeast was calculated to contain from 16 to 18, and the wheat embryo 8 international units per gram.

The standard was found to undergo little if any deterioration after storage for a year either at room temperature, at 37° C., or in a refrigerator. Its content of vitamin G was negligible. The material is considered a much more convenient and practical source of vitamin B in vitamin G experiments than Peters' vitamin B concentrate.

The utilization of proteins in relation to the B vitamins and the alimentary equilibrium of the diet [trans. title], R. LECOQ (*Bul. Soc. Chim. Biol., 14 (1932), No. 7, pp. 1067–1075, figs. 4*).—Conflicting views as to the influence of proteins on the utilization of the B vitamins are reviewed, and feeding experiments on pigeons are reported on diets differing only in their proportions of proteins, carbohydrates, and fats, with and without dried brewery yeast as the source of the B vitamins.

In the four diets used, the proportions of protein in the form of meat peptone and carbohydrate as sucrose were 16 and 66, 24 and 35, 82 and 0, and 59 and 0 per cent, respectively. The first and third of the diets contained 4 per cent of butterfat and the second and fourth 8 per cent of butterfat and 18 per cent of lard. In the absence of yeast polyneuritic symptoms developed in varying degree on all of the diets. The survival periods were longer on the diets in which protein entirely replaced the carbohydrate, and still longer (from 60 to 90 days) on the high protein carbohydrate-free diet rich in fat. The addition of dried yeast either as a preventive or curative agent was followed by prevention or amelioration of polyneuritic symptoms and prolongation of life. On the third diet, containing no carbohydrate and little fat, life was not prolonged beyond from 40 to 90 days.

The author concludes that even in the presence of a large dose of the B vitamins the utilization of proteins is not satisfactory except when the constituents of the ration are in fairly strict equilibrium among themselves, an equilibrium such as in cow's milk surpassing that of cereal grains.

The behavior of glycogen in the organism in the absence of the vitamin B complex (especially vitamin B_1) in the diet [trans. title], E. ABDERHALDEN and E. WERTHEIMER (*Pflüger's Arch. Physiol., 230 (1932), No. 5–6, pp. 601–613*).—Following a discussion of the literature on the possible relationship between vitamin B and carbohydrate metabolism, data are presented and discussed on the glycogen content of various organs of pigeons in advanced stages of vitamin B deficiency brought about by polished rice feeding. The data indicate that the avitaminosis is accompanied by an increase in the content of glycogen in the liver and heart, and that this can be reduced rapidly by the administration of yeast. Inasmuch as the yeast was without effect after autoclaving at 120° C. for six hours, the increase in the glycogen content is attributed to the absence of vitamin B (B_1).

Carbohydrate metabolism in birds.—The site of the biochemical lesion in avian polyneuritis, N. GAVRILESCU, A. P. MEIKLEJOHN, R. PASSMORE, and R. A. PETERS (*Roy. Soc. [London], Proc., Ser. B, 110 (1932), No. B 768, pp. 431–447, figs. 7*).—Further in vitro evidence (E. S. R., 67, p. 634) is reported in confirmation of the theory that vitamin B_1 deficiency is connected essentially with the intermediary metabolism of carbohydrate, specifically with the glucose-lactate enzyme systems.

The independence of vitamin B_1 deficiency and inanition, A. P. MEIKLEJOHN, R. PASSMORE, and R. A. PETERS (*Roy. Soc. [London], Proc., Ser. B, 111 (1932), No. B 772, pp. 391–395, figs. 3*).—Final proof that in pigeons the nervous symptoms in vitamin B_1 deficiency are intimately related to the oxidative behavior of brain tissue, as noted above, and are entirely independent of loss of weight or general inanition is presented in data showing that the oxygen uptake in lactate solutions of the brains of pigeons completely cured of opisthotonos symptoms by dosing with vitamin B_1 concentrate, but with the administration of no food, was greatly increased over that of similar pigeons killed just after they had come out of the opisthotonos.

The study of the vitamin C potency of spinach under varying conditions, E. PIERSON (*South Dakota Sta. Rpt. 1932, pp. 16–18*).—This progress report (E. S. R., 67, p. 88) summarizes studies on the vitamin C content of commercially canned spinach after reheating and exposure to the air for 24 hours and of fresh and canned New Zealand spinach.

The determination of vitamin D in the line test by measurement, R. S. MORGAN (*Biochem. Jour., 26 (1932), No. 4, pp. 1144–1154, figs. 5*).—A modification of the customary line test for determining vitamin D is described, in which the degree of healing is expressed as the area of new calcification measured on magnified camera-lucida drawings of the bone sections. This is thought to have the advantage over the method of Bourdillon et al. (E. S. R., 68, p. 132) of matching X-ray photographs against a standard series, or any other technic involving a comparison with an ideal series. A much finer gradation of healing is also distinguishable.

The technic is described, and data are given showing its use in measurements of the relation between dosage and healing, interpretation of assays, calculation of errors, and variations in healing produced by standard preparations at different periods of the year.

Within the range studied, the healing as thus measured was found to be proportional to the logarithm of the dose of vitamin D. The estimated probable error in an assay based on 10 pairs of rats was +7.7 or —7 per cent. The chief source of error was thought to be the variable response of litter mates

to a given dose of the vitamin. The influence of other factors such as sex and weight was found to be negligible.

The effects on dogs of large doses of calciferol (vitamin D), H. Dale, A. Marble, and H. P. Marks (*Roy. Soc. [London], Proc., Ser. B, 111 (1932), No. B 773, pp. 522–537*).—Pure crystalline vitamin D, calciferol, prepared as described by Askew et al. (E. S. R., 67, p. 201), when fed to dogs in excessive doses was found to have the characteristic toxic action of the crude irradiated ergosterol, thus showing that the toxicity of the latter is not due to by-products of irradiation. The toxic action, including congestion of the mucous membranes of the gastrointestinal tract, was produced by intravenous injection as well as by ingestion of the calciferol. Complete parathyroidectomy, although lowering somewhat the level of the blood calcium, did not prevent or hinder to any appreciable degree the fatal intoxication. "The results lend no support to the suggestion that vitamin D in excessive doses acts by promoting secretion of the parathyroid hormone, or by rendering the organism more responsive to its action."

The toxicity of vitamin D [trans. title], F. Goebel (*Jour. Physiol. et Path. Gén., 30 (1932), No. 2, pp. 379–382*).—Preparations of irradiated ergosterol from different commercial sources and samples prepared in the laboratory with varying lengths of irradiation were found to differ widely in their toxicity for rats when fed in massive doses of the same antirachitic activity as determined biologically. Evidence was also obtained that excess of calcium contributed in large measure to the production of the hypervitaminosis.

On the fundamental nature of parathormone action, J. P. McGowan (*Biochem. Jour., 26 (1932), No. 4, pp. 1138–1143, pl. 1*).—An attempt has been made to relate the nature of the action of vitamin D (E. S. R., 67, p. 345) and of parathormone by administering large doses of the latter to laying hens, the blood serum of which has a high calcium content, and examining at death sections from practically every organ and tissue for the presence of tricalcium phosphate.

The action of parathormone was found to differ fundamentally from that of excess vitamin D in that the deposits of tricalcium phosphate were chiefly intravascular. The suggested explanation of the action of parathormone is the liberation of calcium hydrogen phosphate from the bones by direct stimulation of the activity of the osteoclasts. These observations are thought not to lend support to the theory that vitamin D acts primarily through the parathyroid glands. "In considering this point, the relevant occurrences in vitamin D poisoning seem to be somewhat as follows: In the first place, a production of free phosphoric acid as the primary effect of vitamin D action appears to occur in the tissues, which, in turn, attracts calcium from wherever it can, the intestines or bones, for neutralization purposes. This need for neutralization is urgent, and calcium may be withdrawn from the blood more quickly than it can be replaced from the above sources. Hence a hypocalcemia may develop which could serve to stimulate the parathyroid to activity, with the liberation of further quantities of calcium from the bones."

Oysters and anemia, E. J. Coulson, H. Levine, and R. E. Remington (*Amer. Jour. Pub. Health, 22 (1932), No. 11, pp. 1141–1146, fig. 1*).—A previous study of the antianemic potency of oysters from a single locality (E. S. R., 67, p. 91) has been extended to samples of oysters from all important producing areas on the Atlantic and Gulf coasts of the United States. The samples were collected in April and in November and December, 1931. Data are reported on the iron, copper, and manganese content of the samples tested, grouped by season and by locality, and on their antianemic potency tabulated in order of decreasing iron content.

The range in iron content of the 5-g samples which constituted the daily dose was from 0.523 to 0.137 mg and in copper content from 0.03 to 0.548 mg. The copper content did not run parallel to the iron content, but the four samples with the lowest content of iron (from Rhode Island, New Jersey, Connecticut, and New York) had the highest copper content. The time required to reach normal hemoglobin concentration in general increased with decreasing iron content from 3.2 weeks for the sample with the highest iron content to over 8 weeks, but showed no relation to the copper content. The lack of relationship between copper content and hemoglobin regeneration is explained on the ground that all of the oysters contained an abundance of copper, and that at the level of oysters fed it was the iron rather than the copper that fixed the rate of recovery.

It is estimated that the rats received about 5 per cent of their calorie intake in the form of oysters, an amount proved adequate for regeneration of hemoglobin. It is also noted that "an average serving of oysters (110 g) would furnish about 2 per cent of the human calorie requirement (3,000 calories) and yield about 41 per cent of the daily dietary standard for iron, stated by Sherman [E. S. R., 55, p. 691] to be about 15 mg."

Observations on the haematopoietic hormone (addisin) in pernicious anaemia, R. S. Morris, L. Schiff, J. H. Foulger, M. L. Rich, and J. E. Sherman (*Brit. Med. Jour., No. 3753 (1932), pp. 1050, 1051*).—The hematopoietic hormone "addisin," described in a preliminary report (E. S. R., 67, p. 629), has been identified in gastric juice concentrated in vacuo from swine, dogs, and cattle and is, therefore, thought to be a constituent of the normal gastric juice of omnivora, carnivora, and herbivora. The activity of the concentrate from swine gastric juice has been demonstrated by intramuscular injection in patients with pernicious anemia. A case history is given in illustration. The intravenous injection of 4 c c of a fraction representing 3 l of swine gastric juice in a patient suffering from pernicious anemia was followed by a gradual rise in reticulocytes over a period of 34 days. An increase in the number of cells and in the percentage of hemoglobin was first noted at the end of 2 weeks, and was followed by a steady increase in both to values of 4,500,000 red cells and a hemoglobin of 93 per cent at the end of nearly 4 months as compared with initial values of 1,600,000 red cells and 50 per cent hemoglobin.

The aetiology of dental caries, E. W. Fish (*Brit. Med. Jour., No. 3746 (1932), pp. 747–749, figs. 2*).—This and the paper noted below were read in opening a discussion on the subject at the 1932 meeting of the British Medical Association. The author's views are summarized as follows:

"All the evidence seems to point to caries being a saprophytic phenomenon occurring in morphological fissures, developmental enamel faults, or in the permeable necks of teeth. In no case can its occurrence be prevented by vital reaction on the part of the formed tooth, though its extension may be delayed. The prevention of decay appears to be possible only by rendering the mouth unsuitable as an environment for the saprophytes concerned, or by breeding a race free from morphological crevices and developmental enamel faults, whose gums will never recede."

The aetiology of dental caries, M. Mellanby (*Brit. Med. Jour., No. 3746 (1932), pp. 749–751*).—The author reviews briefly the investigations on puppies (E. S. R., 63, p. 391) and children (E. S. R., 68, p. 280) which have led her to conclude that the structure of the tooth is a factor of the highest importance in its liability to decay and that this depends upon the diet during the period of growth. Vitamin D is considered essential both for the calcification of the teeth and their later resistance to disease, the quantity required depending on

other factors of diet and environment. Belief is reiterated in the presence in cereals of a toxamin which antagonizes the effects of vitamin D and calcium. "We must, therefore, I believe, concentrate upon the development of more perfect teeth and later also upon increasing their resistance to decay. The practical application of our present knowledge should in time help to diminish the scourge."

Calcium and phosphorus of saliva in relation to dental caries, R. B. HUBBELL and R. W. BUNTING (*Jour. Nutrition, 5 (1932), No. 6, pp. 599–605*).—Previous attempts to show a relation between dental caries and the amount of calcium in the saliva are reviewed, and data are reported on the content of calcium and phosphorus in the saliva in a considerable number of school children from 7 to 16 years of age. No relation could be observed between the calcium and phosphorus content of the saliva and the occurrence of dental caries. In a period of about three months during which the diet of some of the children was supplemented by daily additions of 1 qt. of milk and 2 oz. of tomato juice, with or without 8 drops of viosterol, there was a slight tendency toward a decrease in the incidence of dental caries in the group receiving the supplements, but in the findings during a period of the same length in which no supplements were fed the differences were not marked and were not accompanied by any consistent change in the salivary calcium and phosphorus. In a total of 902 determinations on children with active caries, the average concentrations of calcium and phosphorus in the saliva were 5.1 and 12.8 mg per 100 c c, respectively, and in a total of 275 determinations on children free from caries the values were 5.4 and 13.3 mg per 100 c c, respectively.

The relation of calcium and phosphorus in the diet to the cause of mottled enamel of human teeth, R. M. LEVERTON and M. C. SMITH (*Jour. Home Econ., 24 (1932), No. 12, pp. 1091–1097*).—This paper reports a quantitative study of the diet of 19 children in the Arizona community in which the previously noted mottled enamel investigation was conducted (E. S. R., 65, p. 596).

Individual composites were made of the food intake during a period of three weeks, and the composites were analyzed for calcium, phosphorus, nitrogen, and calories. The food intakes of the 16 children suffering from mottled enamel were compared with those of the 3 children who showed no mottling of the enamel, and all intakes were compared with dietary standards for optimal growth and nutrition.

The daily intakes of calcium averaged 1.15 g for the children with mottled enamel and 1.18 g for the others. Corresponding values for phosphorus were 1.06 and 1.04 g. Protein and energy intakes were practically normal for both groups. Although a question was raised as to the availability of the calcium on account of a low milk consumption, the data are thought to show that adequate calcium and phosphorus intakes are incapable of preventing the development of mottled enamel in children "exposed to the environmental factors of an endemic community."

Estimates of the vitamin C content of the diets showed a much lower intake in the children with severest mottling and pitting of the teeth. The possible importance of vitamin C in affecting the severity of the mottling is thought to warrant further investigation.

Milk irradiated by the carbon arc lamp: A clinical and laboratory study of rickets, A. F. HESS and J. M. LEWIS (*Jour. Amer. Med. Assoc., 99 (1932), No. 8, pp. 647–653, figs. 2*).—Clinical and laboratory tests with milk quantitatively irradiated, as described by Supplee et al. (E. S. R., 67, p. 489), are reported and discussed. The investigation was conducted under similar conditions to those of the previous year with irradiated yeast milk (E. S. R., 66, p. 493).

The milk was found to be a highly effective and reliable antirachitic agent both from a prophylactic and curative point of view. A quart, or even less, of the milk daily sufficed to protect infants from rickets, although this quantity contained only 50 units of vitamin D as determined by standard methods. It is noted that the same discrepancy in standardization was also found to hold true for tests of milk from cows which had been fed irradiated yeast.

In conclusion, the authors attempt to appraise the relative values of different antirachitic agents now in use in the prevention and cure of rickets. Of these, irradiated milk is considered to have two advantages, one that milk is an indispensable food for all infants and the other that irradiated milk is an inexpensive source of vitamin D in cities where it can be produced. It has the limitation, however, of being available at present only in certain cities. Irradiated yeast milk is also of great value, but at present its production is limited to certain certified farms where the ration of the cows is thoroughly controlled and where frequent tests of the activity of the milk can be carried out. Cod-liver oil is a reliable antirachitic agent, but has the disadvantage of having a disagreeable taste and odor. Viosterol is recommended as the best agent for the cure of rickets and for its prevention in the premature infant. Irradiated yeast is thought to be ruled out on account of its disagreeable taste except as it may prove useful for nursing mothers. Direct ultra-violet irradiation is a valuable and effective measure, but limited in application on account of requiring the use of special apparatus.

The question is raised of the desirability of children and adults partaking indiscriminately of foods rich in vitamin D. "Besides the necessity for control of the potency of these products, which probably will be within therapeutic bounds unless some error occurs in the course of preparation, it may be questioned whether Federal license and supervision should be required before such antirachitic foods are allowed to be marketed."

Rickets in rats, XIII, XIV (*Jour. Biol. Chem., 98 (1932), No. 1, pp. 207–224, fig. 1*).—In continuation of the investigation noted previously (E. S. R., 66, p. 692), two papers are presented.

XIII. *The effect of various levels and ratios of calcium to phosphorus in the diet upon the production of rickets*, H. B. Brown, A. T. Shohl, E. E. Chapman, C. S. Rose, and E. M. Saurwein (pp. 207–214).—Studies dealing with the effect of absolute, as well as relative, amounts of calcium and phosphorus in the diet on the production of rickets in rats are summarized as follows:

"Analysis of the blood serum of rats for inorganic phosphate and examination of the bones by X-ray, histological sections, and ash analysis, after 21 days on a diet deficient in vitamin D, reveal that the ratio of Ca : P and the salt level are interdependent. At a given level of calcium (or phosphorus), increasing the ratio of Ca : P intensifies the degree of rickets. At a given ratio of Ca : P, increasing the level of salts diminishes the degree of rickets. Hence, both the level and the ratio of calcium to phosphorus are necessary adequately to characterize the ricketogenic properties of a diet."

It is thought that the unlike effects of the rachitic diets of Sherman and Pappenheimer (diet 84), McCollum et al. (diet 3143), and Steenbock and Black (ration 2965) can be explained on this basis without bringing into question the relative utilization of various forms of phosphorus.

XIV. *A diet which demonstrates the effect of the acid-base content upon the production of rickets and also causes idiopathic tetany*, A. T. Shohl, H. B. Brown, E. E. Chapman, C. S. Rose, and E. M. Saurwein (pp. 215–224).—In an effort to produce in rats a less drastic form of rickets, more comparable to the milder diseases of infancy, and thus afford a new opportunity to study the disputed question of the importance of the acid-base content of the diet, a rickets-producing ration of moderately low phosphorus content and of the

same Ca : P ratio as the Steenbock-Black ration 2965 was altered step by step by the addition of phosphate until it became normal (2 : 1), and parallel diets at each step were made acid, neutral, or basic.

"Under such conditions in the intermediate groups, diets were found which produced the mild healing type of rickets when acid, and no rickets when neutral or alkaline. The mild healing type of rickets was associated with idiopathic tetany."

The authors conclude that the ratio of Ca : P is the main factor, and that the acidity, within the limits tested, is a distinct but secondary factor in the production of rickets.

TEXTILES AND CLOTHING

Studies in the sampling of cotton for the determination of fibre-properties, I–III, R. S. Koshal and A. J. Turner (*Indian Cent. Cotton Com. [Bombay], Technol. Bul., Ser. B, 1930, Nos. 6, pp. [2]+46, figs. 10; 10, pp. [2]+39, figs. 3*).—Tests of length, width, number of convolutions, strength, and rigidity were made on about 3,000 fibers of a strain of Surat cotton.

I. *Introductory and experimental* (pp. 1–5).—The experimental technic is described briefly.

II. *Frequency curves for various fibre-properties* (pp. 5–46).—The frequency distributions for fiber length and convolutions were found to be moderately symmetrical and nearly normal; for fiber width, symmetrical and practically normal; for fiber strength, moderately asymmetrical; and for fiber rigidity, extremely asymmetrical. The causes of asymmetrical distributions of fiber strength and rigidity, discussed in some detail, are ascribed either to a change in external conditions of growth during the plant's life history or to mutual interference of the fibers under ordinary growth conditions. An appendix explains statistical terms and methods used in curve fitting, with examples of applications to fiber properties.

III. *The size and reliability of a satisfactory sample* (p. 39).—Selection of individual fibers from a prepared sliver in which the fibers had been mixed thoroughly showed a bias favoring selection of the longer fibers. It was, therefore, deemed inferior to taking small bunches of fibers from different parts of the sliver and testing every fiber in such bunches. The mean value (arithmetic mean) usually is satisfactory as a single value, representing all test values for a sample, but in fiber rigidity, whose distribution is extremely asymmetrical, the mean value must be used with caution as it is affected greatly by high individual values, which sometimes are 10 times as large as the arithmetic mean. With fiber length, fiber width, and convolutions, which give nearly symmetrical frequency distributions, the mean value and probable error of a single observation suffice to indicate the composition of a sample, but in fiber strength, and particularly in fiber rigidity, the composition of the sample should be indicated by means of the upper and lower quartiles besides the mean value. The number of tests recorded as satisfactory for determinations of fiber length, fiber strength, fiber rigidity, and convolutions called for 500 fibers each for a representative sample, and for fiber width, 300 fibers.

The weight per inch of fibres of different lengths, and the numbers of fibres of different lengths per seed, for each of the standard Indian cottons, R. L. N. Iyengar and A. J. Turner (*Indian Cent. Cotton Com. [Bombay], Technol. Bul., Ser. B, No. 7 (1930), pp. [2]+24, figs. 5*).—Further studies (E. S. R., 63, p. 827), involving 18 standard Indian cottons and 5 American cottons, led the authors to question the view that the fiber weight per unit length is the same for different lengths of fiber of a given cotton. Among *Gossypium hirsutum* cottons, the longer fibers of a given cotton generally had

less fiber weight per inch, whereas the *G. herbaceum*, *G. neglectum*, and *G. indicum* cottons did not generally show a large change of fiber weight with fiber length. In spite of variation of fiber weight with fiber length in some cases, the effect upon mean fiber weight was not enough to make this essentially different from the value obtained by the ordinary cutting method wherein such variation is ignored. However, the cutting method might give rise to error due to variation of fiber weight along the length of a single fiber. Data showed that the number of fibers per seed may differ greatly for different species, for different varieties of the same species, or for the same variety in different seasons. For a series of cottons, differing not only in conditions of growth but also in variety and species, there appeared to be no direct proportionality between the number of fibers per seed and the lint index, or ratio of the lint weight per seed to the seed weight, or ginning percentage.

Variations in the properties of the cotton fibre in relation to its position on the surface of the seed.—Part I, (1) Fibre-length, (2) fibre-weight, (3) fibre-strength, R. S. Koshal and N. Ahmad (*Indian Cent. Cotton Com. [Bombay], Technol. Bul., Ser. B, No. 14 (1932), pp. [2]+56, figs. 8; also in Jour. Textile Inst., 23 (1932), No. 10, pp. T211–T266, figs. 8*).—Physical properties of fibers were determined for lint of a Surat strain and of six standard Indian cottons taken from the apex, base, and right and left flanks of the seed, and fibers removed by combing.

The frequency distribution of fiber length proved to be approximately symmetrical and normal for fibers from the whole seed as well as from different regions of the seed. The mean fiber length for fibers at the base was greater than for fibers at the apex. The asymmetrical distribution of fiber strength is a characteristic of all fibers from the seed, and also, in the different regions of the seed, the distribution of fiber strength is definitely skew. The mean fiber weight per unit length and mean fiber strength were higher for apical than for basal fibers. The values of the mean fiber lengths, fiber length distribution, fiber weight, and fiber strength were practically the same for the right and left flanks. Fibers removed in combing were generally those with the least fiber weight. For most fibers (about 80 per cent) the point of rupture in single hair breaks was located in the apical portion of the fiber, and a low correlation between the point of break and strength indicated a tendency for the comparatively weak fibers to break near their apical ends. The percentage differences between base and apex mean values of the various fiber properties differed for different cottons. A distinct tendency was noted for a high ginning percentage to be associated with low percentage difference between mean fiber length of hairs taken from the apex and base of a seed. Practical applications of the investigation are pointed out.

Flax, I, II (*Der Flachs.—I. Abt., Botanik, Kultur, Aufbereitung, Bleicherei und Wirtschaft des Flachses. II. Abt., Flachsspinnerei. Berlin: Julius Springer, 1930, vol. 1, pp. IX+427, figs. 167; 1931, vol. 2, pp. VIII+256, figs. 175*).—Volume 1 comprises in successive sections discussions of the physics of natural cellulose fiber in relation to its fineness, by C. Steinbrinck; on the characteristics, botanical relationships, fiber characters, cultural and harvesting practices, and breeding of flax, by E. Schilling; retting of plants and extraction of fibers, by W. Müller; the bleaching and mercerization of flax, by W. Kind; and the flax fiber industry throughout the world and in different countries, by P. Koenig. Volume 2, by W. Sprenger, treats of the trade in and storage of raw flax; preparation for spinning; spinning; reeling, drying, and packing linen yarn; servicing and maintenance of machiery and equipment; special features of a flax spinning mill; characteristics and testing of linen yarn; computations; and throwing of linen yarn.

The influence of various grades of wool on some of the physical properties of flannel, E. PIERSON (*South Dakota Sta. Rpt. 1932, pp. 18, 19*).—Conclusions are drawn from textile studies on fibers from serveral breeds of sheep and on yarns and fabrics made therefrom.

HOME MANAGEMENT AND EQUIPMENT

Human energy cost of various household tasks, VEN. W. SWARTZ (*Washington Col. Sta. Bul. 275 (1932), p. 37*).—This progress report summarizes briefly data on the energy cost of paring potatoes, ironing napkins, and carrying on laundry processes.

Utensils for the electric range, E. H. ROBERTS (*Washington Col. Sta. Bul. 275 (1932), p. 38*).—A brief summary is given of the conclusions to date in an investigation on the effect of various factors on the thermal efficiency, speed of heating, and heat retention properties of electric range utensils, following the method noted in earlier reports by Swartz (E. S. R., 65, p. 697).

MISCELLANEOUS

Forty-third Annual Report [of Arizona Station], 1932, P. S. BURGESS ET AL. (*Arizona Sta. Rpt. 1932, pp. [2]+41–133, figs. 20*).—The experimental work not previously abstracted is for the most part noted elsewhere in this issue. Meteorological observations are also reported.

[Michigan] Experiment Station Report [for the] biennium ended June 30, 1932, V. R. GARDNER (*Michigan Sta. Bien. Rpt. 1931–32, pp. 63*).—The experimental work not previously abstracted is for the most part noted elsewhere in this issue.

Agricultural research—its service to the State: Thirty-eighth Annual Report of the [Montana Station], 1931, F. B. LINFIELD (*Montana Sta. Rpt. 1931, pp. 113, figs. 36*).—The experimental work not previously abstracted is for the most part noted elsewhere in this issue. Meteorological data are also included.

Forty-fifth Annual Report of the South Carolina Experiment Station, [1932], H. W. BARRE, G. H. AULL, ET AL. (*South Carolina Sta. Rpt. 1932, pp. 139, figs. 29*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Annual report of the director [of South Dakota Station] for the fiscal year ending June 30, 1932, J. W. WILSON ET AL. (*South Dakota Sta. Rpt. 1932, pp. 32*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Forty-second Annual Report [of Washington College Station], 1932, E. C. JOHNSON ET AL. (*Washington Col. Sta. Bul. 275 (1932), pp. 84*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Report of the West Virginia Agricultural Experiment Station for the biennium ending June 30 1932, F. D. FROMME (*West Virginia Sta. Bul. 254 (1932), pp. 60, figs. 7*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Forty-second Annual Report of [Wyoming Station, 1932], J. A. HILL (*Wyoming Sta. Rpt. 1932, pp. 48*).—In addition to meteorological observations noted on page 733, the experimental work not previously referred to is for the most part abstracted elsewhere in this issue.

List of publications of the United States Department of Agriculture from January, 1926, to December, 1930, inclusive, compiled by M. G. HUNT (*U. S. Dept. Agr., Misc. Pub. 153 (1932), pp. II+46*).—This supplements the list previously noted (E. S. R., 58, p. 696).

NOTES

California Station.—Dr. John Belling, research associate in genetics and widely known for his studies in genetics, cytology, and the use of the microscope, died February 28. He was born in England on October 7, 1866, receiving the B.S. degree from the University of London. After several years' service in England, Wales, and the British West Indies, he became assistant botanist in the Florida Station in 1907. In 1921 he was appointed cytologist in the Carnegie Institution of Washington, working especially on the chromosomes of Datura, and was subsequently transferred by that institution to the University of California, where he continued his fundamental studies of the structure of chromosomes in hyacinths and various lilies. He had published a book on the use of the microscope and had completed a treatise embodying the results of his studies of the chromosomes. He received the honorary D. Sc. degree from the University of Maine in 1922.

Colorado Station.—Fred E. Goetz, associate in mechanical engineering, died December 21, 1932, after a brief illness. He was born in Michigan August 21, 1904, and received the B. S. degree in agricultural engineering from the University of Saskatchewan in 1929 and the corresponding M. S. degree from the Kansas College in 1930, coming to Colorado in the fall of the latter year.

Kansas College and Station.—According to a note in *Kansas Industrialist*, State appropriations for the ensuing biennium will aggregate $1,881,700. This is a reduction from $2,631,582 for the present biennium, but of the latter amount $427,972 was impounded by the board of regents and returned to the State treasury. The new appropriations are thus far about 16 per cent less than the present expenditures. The reductions include among other items the elimination of new construction and the soil survey and decreases for salaries and wages from $1,362,900 to $1,022,200, maintenance from $700,000 to $525,000, laboratory equipment from $40,000 to $30,000, veterinary research from $40,000 to $20,000, and extension work from $203,682 to $160,000.

C. W. Oakes, miller in the department of milling industry, has resigned effective February 14 to accept a position as mill superintendent of a milling company in Leavenworth.

Minnesota University and Station.—Clarence H. Eckles, professor of dairy husbandry and chief of the division of dairy husbandry in the station, died February 13 at the age of 58 years. Dr. Eckles was a native of Iowa and received from the Iowa College the B. S. A. degree in 1895, the M. S. degree in 1897, and the honorary D. Sc. degree in 1916. He had also studied extensively at the University of Wisconsin, Göttingen University, and the University of Bern. He had served in turn as assistant dairy bacteriologist in the Iowa Station from 1896 to 1901, as professor of dairy husbandry and dairy husbandman in the Missouri University and Station from 1901 to 1918, and subsequently as chief of dairy husbandry in Minnesota.

As is brought out in a recent statement by Vice Director Boss, "in his passing the Minnesota Experiment Station has lost an outstanding scientist and a highly influential member of its staff. His researches in the field of dairy

science and particularly in nutrition lines have been of the highest order. His reputation in his field was world-wide. Rarely indeed is there found a man with such insight into oncoming problems or with a keener sense of correct procedure in prosecuting research and in applying the findings to the industry affected. Not only was he effective himself but he possessed the power to stimulate to research, and through the medium of graduate seminars and individual problems has developed many young men who have later become leaders in dairy science in other institutions. His loss will be keenly felt not only by the Minnesota Experiment Station but by all stations and institutions in which attention is given to the development of dairy science. Fortunately, Dr. Eckles was a productive worker and has left much in the written word in the form of both books and bulletins which will serve as a foundation on which others may build and carry on."

Cornell University.—Announcement is made that undergraduate professional courses in forestry are to be discontinued in the College of Agriculture, the final class to be graduated at the end of the academic year 1935–36. The present permanent staff in the college department of forestry will be continued, and elementary courses in wood lot management, extension work in forestry, and graduate instruction in general forestry will still be offered.

John Lemuel Stone, emeritus professor of farm practice since 1919, died March 8 at the age of 81 years. A native of Pennsylvania, he was among the first agricultural students in the university, graduating in 1874. He then engaged in farming until 1897, when he returned to the university. He was appointed assistant professor of farm practice in 1903 and professor in 1907. His duties were in part in resident instruction and the supervision of the university farm, but for many years primarily as an extension worker and short course leader, in which fields he was a pioneer of wide influence. In recognition of his services, one of the buildings of the agricultural group was named in his honor. In the words of a resolution passed by the university faculty and trustees upon his retirement, "through his thorough knowledge of farm practice, coupled with a keen appreciation of scientific values, he was able to render distinguished service to agricultural interests at a time when the colleges of agriculture were struggling for recognition. The farmers of the State will always be his debtors."

New York State Station.—Orrin M. Taylor, actively associated with the horticultural work of the station from 1896 to 1926, died December 25, 1932. Leon R. Streeter, chief of research in chemistry and connected with the station since 1921, died December 26. He was a graduate of Colgate University in 1919 and received the M. S. degree from the University of Maine in 1922. His work in the station had been mainly with insecticides and fungicides.

South Dakota Station.—Minerva Kellogg has been appointed research assistant in home economics vice Grace Wasson, resigned.

Wisconsin University and Station.—*Science* notes that a broad basic patent on the use of inorganic compounds of iron and copper for the prevention and treatment of anemia has been granted to Dr. E. B. Hart, chairman of the department of agricultural chemistry. This patent has been assigned by Dr. Hart to the Wisconsin Alumni Research Foundation to insure the therapeutic presentation of the compounds in accord with the proper formula and to protect the public from exploitation of uncontrolled commercial use.

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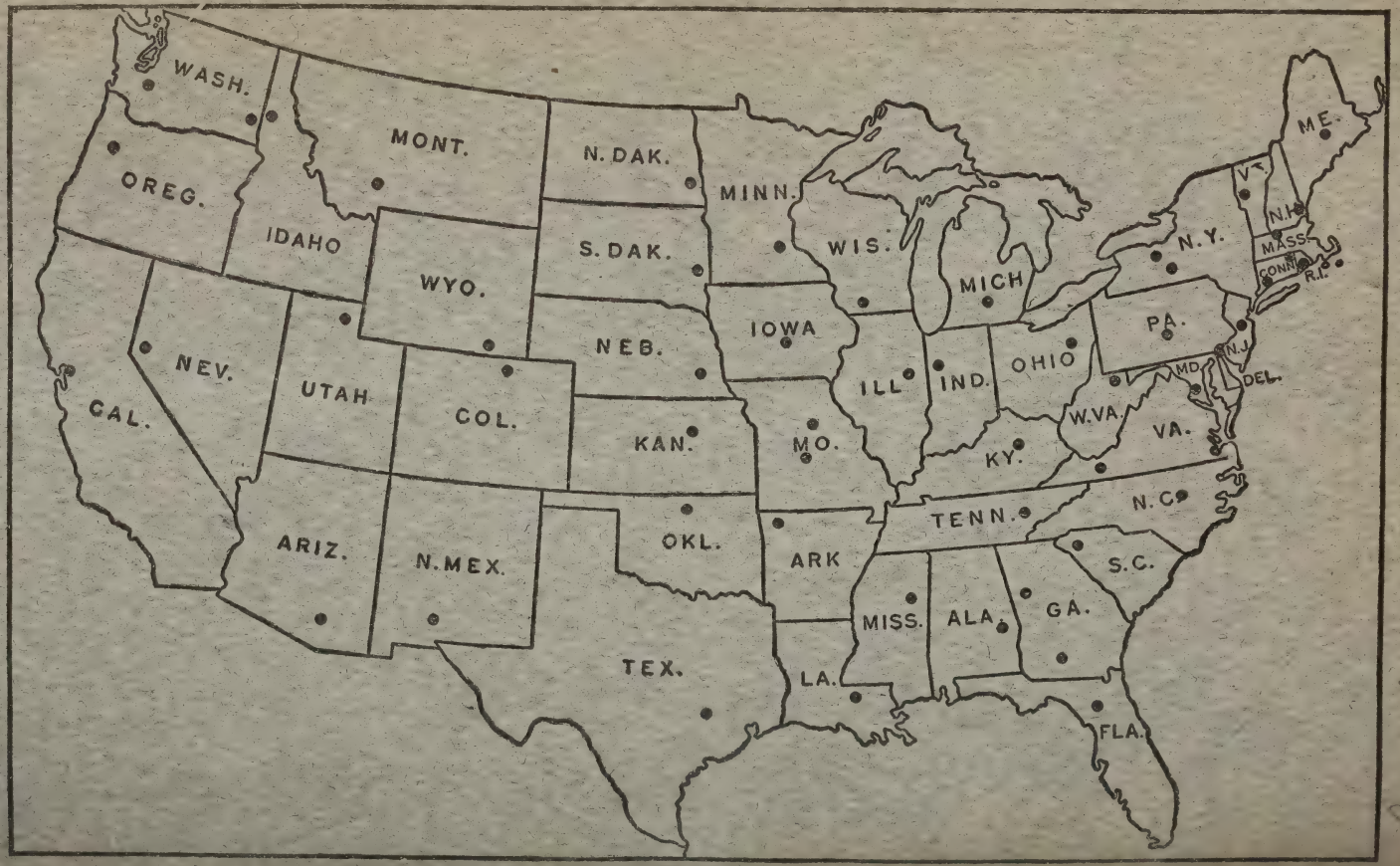
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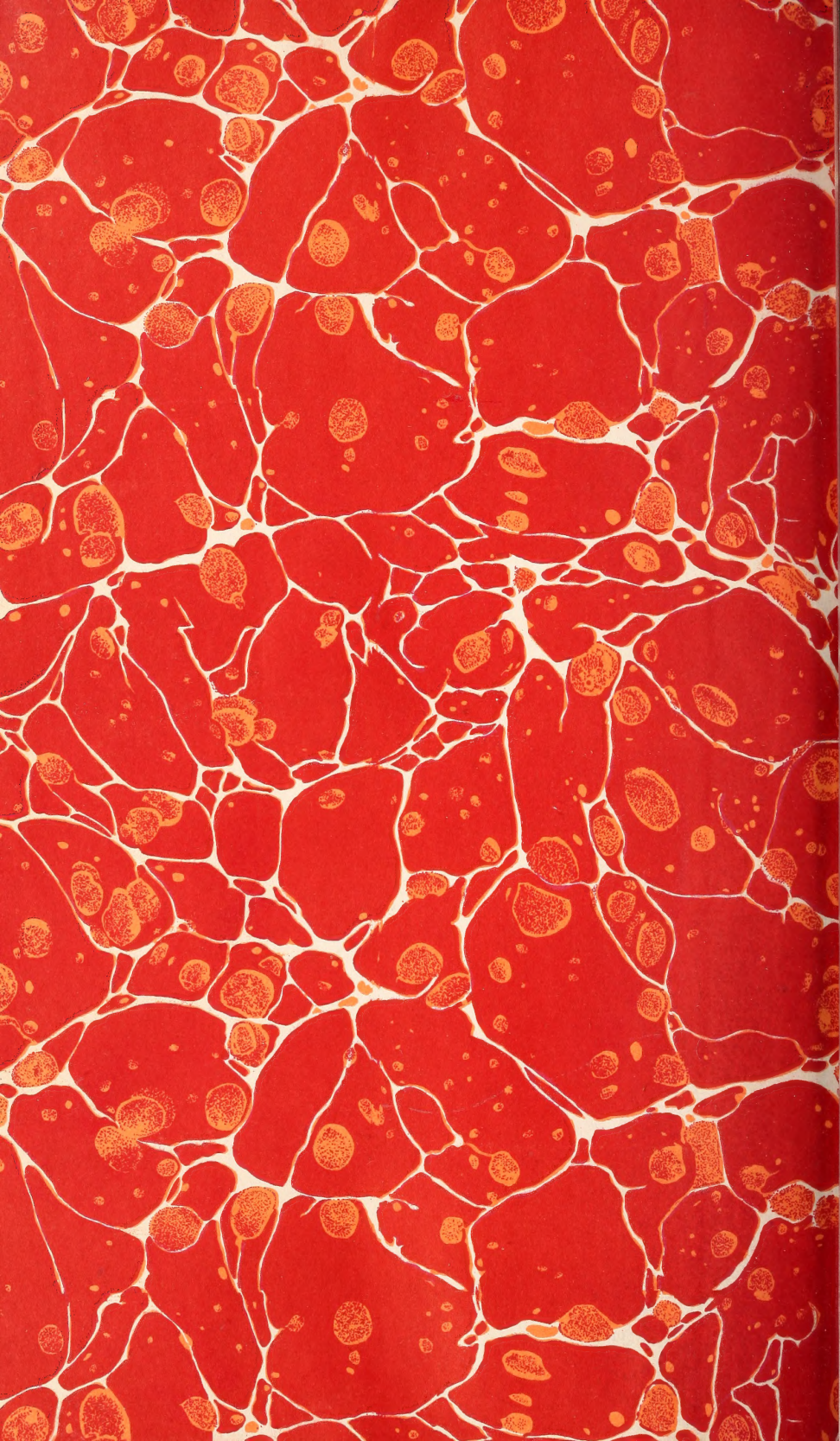
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